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E. E. KING EXAMINING THE TEETH

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The Birds of the Northern Territory

By H. T. CONDON.

PART 2.

Bird life is more numerous in the extreme northern coastal regions than in the central areas. Thousands of water fowl frequent the lagoons and swamps, while hosts of others live in the open forests and jungles. Large flocks of finches abound, and, in peace time, form the livelihood of many bird-trappers. With the exception of the Emu (*Dromaeus novaehollandiae*), which is prized as food by the natives, the birds have not been affected to any extent by the depredations of the aborigines. The Emu roams in the open forest lands as well as on the plains, and is distributed throughout the mainland, but does not appear to be on any of the adjacent islands. One of the best-known birds in the Territory is the Plain Turkey or Bustard (*Eupodotis australis*). It is brown above and white below, with a black band on the chest and has long yellow legs with very small toes. It is in fair numbers in all parts of the State. Birds of prey are numerous. The commonest hawk is the Black or Fork-tailed Kite (*Milvus migrans*), which may be seen in most localities from Alice Springs to Darwin. The Black Kite is a dark-coloured bird with a deeply forked tail. It is a great scavenger and often gathers in flocks of thousands around killing yards and habitations. The largest hawk is the Wedgetailed Eagle or Eaglehawk (*Uroaetus audax*), but it is not numerous in all districts. One of the most unusual hawks in Australia is the Crested Hawk (*Baza subcristata*), which lives in the northern areas. It is a medium-sized bird, brownish in colour, with barrings on the breast and with a small crest. It frequently indulges in aerial acrobatics. The familiar Nankeen Kestrel (*Falco cenchroides*) or so-called "Sparrowhawk" of the south inhabits the central regions and is rare above Tennant Creek.

Two species of Sea-eagles frequent the coast and river estuaries. The Red-backed Sea-eagle (*Haliastur indus*) is easily identified by its white head, neck and breast and chestnut upper surfaces, but the young of the White-bellied Sea-eagle (*Haliaetus leucogaster*) is similar in colouration to the Wedgetailed Eagle. The adult is dark grey above and white below. Another common bird of prey is the Whistling Eagle (*Haliastur sphenurus*), a medium sized brownish hawk with a querulous whistling cry.

In the northern jungles the Jungle Fowl (*Megapodius reinwardt*) may be met with. It is about the size of a domestic fowl, dark grey in colour, and is remarkable on account of the huge nesting mound or incubator which it builds. Some of these mounds have been known to exceed 12 feet in height and have a circumference of 150 feet. Numerous eggs are deposited in the mound and are hatched by the heat generated by decaying vegetation placed therein by the birds previously.

Cockatoos and parrots of many species are numerous. The large Red-tailed Black Cockatoo (*Calyptorhynchus banksi*) occurs in most parts. It is usually seen in flocks and has a feeble cry which is not unmusical. The Pink Cockatoo or Major Mitchell (*Kakatoe leadbeateri*) is confined to the more central parts. Galahs (*Kakatoe roseicapilla*) occur in all districts. In timbered country throughout the State may be heard the harsh cries of the White or "Sulphur-crested" Cockatoo (*Kakatoe galerita*).

One species of Rosella is found in the open forests of the north. It is the Northern Rosella (*Platycercus venustus*), also called Brown's Parrot or Smutty Parrot. It is a small species, with a black head and back (with pale yellow markings), white cheeks edged with blue, and red under the tail. It is nowhere very numerous.

The Northern Territory is noted for its many species of smaller parrots. Most of these occur in huge flocks, such as the Budgerygah (*Melopsittacus undulatus*), and the Varied Lorikeet (*Psitteuteles versicolor*). The lastnamed is confined to the more coastal regions, but may be met with several hundreds of miles inland in the open forests.

1 SAVANNA WOODLAND 2 SAV. WOODLAND AND GRASSLANDS 3 DESERT SCRUB
4 TROPICAL GRASSLAND 5 TANAMI DESERT 6 CENTRAL HIGHLANDS
7 SPINIFEX

It has a red head, blue cheeks and neck with yellow stripes, and pinkish breast and a green back. In the early morning they may be seen feeding on the nectar of flowering eucalypts. Like most lorikeets they are very noisy in flight. The Crimson-winged Parrot (*Aprosmictus erythropterus*) is a beautiful bird, easily recognised by the rich crimson wings and bright green plumage. Another parrot about the same size as the Crimson-winged Parrot is the Red-collared Lorikeet (*Trichoglossus rubritorquis*), which has an orange-red breast, blue cheeks and green back, with a narrow red collar. A small parrot which nests in termites' mounds or "ant-hills" is the Hooded Parrot (*Psephotus dissimilis*). The male is greenish-blue below, with yellow on the shoulders and a black head. One of the rarer parrots of the interior is the Princess Parrot (*Polytelis alexandrae*), which has delicate pastel shades of grey, green and pink, and a long tail. It has been taken at Howell's Ponds, Newcastle Waters, Glen Edith, Deering Creek, Alice Springs, Crown Point, and on the Hale and Hugh Rivers.

Water birds are common and occur in great flocks on all lakes, swamps and lagoons. Two large birds usually seen near water are the Jabiru or Black-necked Stork (*Xenorhynchus asiaticus*) and the Native Companion or Brolga (*Grus rubicundus*). The Jabiru ranges across tropical Australia and is also found in Malaya, New Guinea, Burma and India. It is usually seen singly or in pairs, and feeds on fishes, frogs, and other water creatures. It is white with a black neck and wings and long beak and legs. The Brolga often associates in large numbers on open plains, when it indulges in "corroborees," many birds performing graceful dancing displays, or "quadrilles." It is a tall grey bird with bright red naked skin on the head, and a long bill. One of the best known water-birds of the north is the Magpie- or Pied Goose (*Anseranas semipalmata*), which is to be seen in thousands on swamps and lagoons. It may also perch in flocks in trees. It is black and white, and unlike other members of the duck tribe has the toes only partially webbed. Other ducks which have the unusual habit of perching in trees are the Tree Ducks (*Dendrocygna*). They are also known as whistling ducks on account of their curious whistling notes. A strikingly handsome species, the White-headed Shelduck (*Tadorna radjah*), is chestnut-coloured on the back, with a white head and breast with a chestnut band.

Teal (*Querquedula* spp.) and Black Duck (*Anas superculiosa*), familiar birds in southern Australia, are also met with in the north. Pelicans, ibises, cormorants, herons and spoonbills are also commonly met with on lagoons and swamps. A rare species in the south, the Glossy Ibis (*Plegadis falcinellus*), is often met with in the tropics. From a distance they appear blackish and are somewhat smaller than the other species of ibises. Actually the plumage is a rich brown. The Darter or "Snake-bird" (*Anhinga novaehollandiae*), so-called on account of its long, "snake-like" head and neck, may be mistaken for a shag or cormorant by the uninitiated. It is a grey bird generally seen about rivers. It has been recorded from Central Australia as well as the coastal river districts.

Pigeons and Doves of several species are familiar birds in the Northern Territory. They usually have a monotonous, mournful call, and when flushed there is a loud flapping of the wings. The Common Bronzewing (*Phaps chalcoptera*), a well-known bird in the south, has been recorded from all parts of the Territory, including Melville Island, Groote Eylandt, MacArthur River and Alice Springs. It is generally found near permanent waters in the inland areas. The Flock Pigeon (*Histriophaps histrionica*) has been taken at the MacArthur River and at MacDonald Downs (north-east of Alice Springs). The small Green-winged Pigeon (*Chalcophaps chrysochlora*) inhabits the jungles of the north, as also does the diminutive Rose-crowned Pigeon (*Ptilinopus ewingi*). The Torres Strait or Nutmeg Pigeon (*Myristicivora spilorrhoa*) is a large white bird with black tail which has been seen as far south as Adelaide River and Katherine. Ground frequenting birds are the Partridge Pigeons (*Geophaps smithi*)—brownish in colour and easily approached. Inland the beautiful Crested Bronzewing (*Ocyphaps lophotes*) is a common bird. It may be recognised by its crest and the peculiar whistling sound made by the wings when in flight.

Three species of Doves occur. The Peaceful Dove (*Geopelia placida*) is met with


PIED BUTCHER BIRD
SPINE TAILED SWIFT
SILVER BACKED BUTCHER BIRD
SPANGLED DRONGO
RED BREASTED BABBLER
CRESTED HAWK
ROYAL SPOONBILL
RED NECKED AVOCET
BLACK FACED CUCKOO SHRIKE
SILVER CROWED FRIAR BIRD
BOWER BIRD
WHITE NECKED PACIFIC HERON
MAGPIE LARK MALE AND FEMALE

everywhere, but its close relative, the Diamond Dove (*Geopelia cuneata*), does not seem to occur further north than Katherine. The Diamond Dove is a small grey bird, with naked red skin about the eyes and fine white spots on the wing coverts. The largest Dove is the Bar-shouldered Dove (*Geopelia humeralis*), a dark brownish bird frequenting the northern open forests and mangroves and timber bordering creeks.

The small ground-frequenting Plumed Pigeon (*Lophophaps plumifera*) inhabits rocky country where spinifex grows. It is reddish-brown in colour with a crest, and usually escapes by running.

Several species of Kingfishers are to be met with. The largest is the Blue-winged Kookaburra (*Dacelo leachi*), a relative of the familiar Laughing Kookaburra or Jackass of the south. It differs from that bird, however, in having more blue on the wings, and is somewhat smaller in size. It also has a different call, which is a poor rendition of the "laugh" of the southern bird, although a likeness can be recognised.

Owls are often seen, in daytime as well as at night. The Barn Owl (*Tyto alba*) is a large white bird, and the Boobook Owl (*Ninox boobook*) is smaller and brown in colour. Both are common southern species.

The Southern Stone Plover (*Burhinus magnirostris*) occurs in all parts of the State. Its skulking habits are well-known, and it relies on its protective brownish colouration to escape detection on the ground. At night a veritable chorus of these birds may be heard uttering their weird wailing cries, which may be rendered as "weeloo." The Sea Curlew (*Numenius cyanopus*) has a long curved beak and brown plumage and frequents swamps and the seashore. The Stone Curlew does not build a nest, but lays its eggs on the bare ground.

The Butcher-birds have clear, flute-like notes. One of our finest Australian songsters is the Pied Butcher-Bird (*Cracticus nigrogularus*), which occurs throughout the Northern Territory. Another species, confined to the northern open forests, is the Silver-backed Butcher-Bird (*Cracticus argenteus*), a beautiful bird which deserves to be better known. It is a fairly common species in the Darwin area. Many species of cuckoos may be met with, including a number not seen in the South. Most cuckoos have parasitical nesting habits, but one, the Pheasant-Coucal (*Centropus phasianinus*) builds a nest and has from three to five chicks. It is a large brown pheasant-like bird, with a long tail and is seen singly or in pairs. It has a most remarkable call, which is often heard at night and has been likened to the sounds produced by water being poured from a narrow-necked bottle. Soldiers have likened it to the warning sound of an air-raid siren. It lives in swamp places and is often called the "swamp pheasant." Another peculiar cuckoo of the north country is the Koel or Cooee-bird (*Eudynamys orientalis*). The male bird is black and the female brown. The call sounds like "ko-el" or "coo-ee." The large grey Pallid Cuckoo (*Cuculus pallidus*), which is a familiar bird in the Spring in the South, may be recognised by its loud, persistent "scale call." Its close relative, the Oriental Cuckoo (*Cuculus optatus*), is similar in appearance to the Pallid Cuckoo, but has brownish barrings on the lower breast, abdomen, and flanks. In the interior, the Black-eared Cuckoo (*Owenavis osculans*) may be recognised by the black stripe on the face and by its long drawn-out mournful call—"fear." The Horsfield Bronze Cuckoo (*Chalcites basalis*) has a mournful call, which may be rendered as "see you" uttered many times, while the Golden Bronze Cuckoo (*Lamprococcyx plagosus*) has a call like someone whistling up a dog. The Mallee Fowl (*Leipoa ocellata*) occurs south-west of the MacDonnell Ranges. It builds a nesting mound which is much smaller than that of the Scrub Fowl. Several species of quails abound. The Stubble Quail (*Coturnix pectoralis*) has a loud call—"churchee-wit," while the Brown Quail (*Synoicus australis*) calls "bee-e-quick." The other species of quails are difficult to identify in the field.

Many species of Flycatchers inhabit the northern areas. The Restless Flycatcher (*Seisura inquieta*) may be distinguished from the Willie Wagtail by its white throat and peculiar call, which has been likened to the noise produced by someone grinding a pair of scissors. For this reason it is sometimes

referred to as the "Scissors grinder." The Willie Wagtail (*Rhipidura leucophrys*) of the north is not as tame and confiding as its southern cousin, and this is possibly due to the fact that it is an unpopular bird with the aborigines, who kill it on every occasion. They say it listens to their conversations and regard it as an evil spirit.

In the central dry areas the Bellbird (*Oreoica gutturalis*) is well known. Its call is very like the sound of a camel bell. The Black-faced Cuckoo-Shrike (*Coracina novaehollandiae*) is met with in all parts. It is a large grey bird with a black face, and often congregates in flocks. It has a peculiar cat-like "mewing" call. The Ground Cuckoo-Shrike (*Pteropodocys maxima*) is a ground-frequenting species with grey plumage and long legs and of wary disposition. It may be seen in the inland regions. Babblers are likeable birds, usually seen in small parties on the ground or in low trees and bushes. The Red-breasted Babbler (*Pomatostomus rubeculus*) occurs in all parts. These birds are very noisy, and have a whitish crown, curved bill and reddish-brown breast.

Some of the most beautiful small birds of the Northern Territory are the "Fairy Wrens" of the genus *Malurus*. In the centre the Blue and White Wren (*Malurus leuconotus*) is often seen. It is pale blue with white wings, and as in all members of the genus the females and young males are plain brown in colour.

In the tropical north another species occurs as far south as Banka Banka. This is the Red-backed Wren (*Malurus melanocephalus*), which is entirely black in the male except for a brilliant orange-red "back." A rarer species of Wren is the Purple-crowned Wren (*Rosina coronata*), which occurs in the vicinity of Birdum and has actions more like those of a flycatcher. The male has a purple crown, black face, brown back and pale blue tail. It is also larger than the other "Fairy Wrens."

Several species of Wood Swallows occur. Probably the commonest one is the Black-faced Wood Swallow (*Artamus melanops*), which is distributed throughout the State. It is a dull brown bird, with a black tail. A diminutive species, the Little Wood Swallow (*Artamus minor*) is of similar colouration but much smaller than the Black-faced Wood Swallow.

Another common bird of the north is the Bee-eater (*Merops ornatus*). It is a bright green bird, with black and orange on the breast, and the central tail feathers have two long plumes. It has a graceful flight and a shrill note. It prefers more open areas and usually obtains its food (insects) on the wing.

The Dollar-bird or Broad-billed Roller (*Eurystomus orientalis*) spends much of its time perched on the highest branch of a dead tree, from which it will dart in pursuit of insects. The name Dollar-bird is derived from the large round pale blue spot on each wing (about the size of a dollar), which is very noticeable in flight. The call is harsh and discordant. The bill is reddish and the wings and tail blue. The north is particularly rich in honeyeaters. In the open forests the largest and most numerous species are the Friar-Birds. These honeyeaters have the head bare and the skin is blackish. In actions they are similar to the Wattlebirds of the south. A noisy species is the Little Friar Bird (*Philemon citreogularis*), which has many harsh and loud calls. A rarer species is the Silver-crowned Friar-bird, which has a whitish stripe on top of the head. Friar-Birds are plain greyish-brown coloured birds, of medium size. Two honeyeaters which are met with throughout the Territory are the Yellow-throated Miner (*Myzantha flavigula*) and the White-plumed Honeyeater (*Meliphaga penicillata*). The former is a medium-sized pale grey bird with yellow bill, legs and throat and wing markings, and is exceedingly numerous in timbered areas. The White-plumed Honeyeater is more yellowish than the southern bird, and is greyish-green on the back with a white stripe near the region of the ear.

Most honeyeaters are noisy, pugnacious birds who are always "on the go." The Yellow Figbird (*Sphecotheres flaviventris*) is an amusing species, being exceptionally active and noisy. It seems to be in a state of constant alarm. It is slightly smaller than a Friar Bird with a bright yellow breast.

The north country is characterised by the number and variety of finches which abound there in certain localities. The Crimson Finch (*Neochmia phaeton*) occurs in swampy localities, while the Gouldian Finch (*Poephila gouldiae*), which is one of Australia's most handsome finches, is often seen far from water. In this species the head may be red or black, and examples of each form occur in the same flock. The body is green, the breast purple, the abdomen yellow and tail blue. Another common finch is the Doublebar or Banded Finch (*Steganopleura bichenovii*), which is brownish coloured with a white face and two narrow black bars on the breast.

In the interior in the Barclay Tableland region and in the vicinity of the MacDonnell Ranges occurs the Painted Finch (*Emblema picta*), which has a scarlet face, neck and breast, pale brown plumage on the upper surface and black on the sides of the chest with white spots.

The familiar Zebra or Chestnut-eared Finch (*Taeniopygia castanotis*) is found in all parts, often in immense flocks. In the dry inland the presence of Zebra Finches is a sure indication of the presence of water in the vicinity.

Two species of Orioles occur in the same localities in the far north. They are large, dull-coloured birds, excellent songsters and mimics. One call is not unlike the word "oriole." They occur in the timbered country, and feed on fruits and native berries.

The Black-backed Magpie (*Gymnorhina tibicen*) occurs on Groote Eylandt and in the vicinity of Alice Springs. Its relative, the White-backed Magpie (*Gymnorhina hypoleuca*), also occurs at Alice Springs and has been recorded from Coniston and MacDonald Downs, further north. Both species are met with in small numbers up to about Banka.

A List of Birds of the Northern Territory

Although 346 species are shown in the following list, it is probable that many more will be added in the future. For an area as large as the one under consideration the number of species which have been recorded is small. However, several obvious gaps will be apparent, especially in the matter of the migratory Waders and sea-birds.

Much work remains to be done on the ornithology of this State, and in the words of Whitlock (1924) "the vast interior is still, in an ornithological sense, practically 'to let'."

The nomenclature employed is that of the Royal Australasian Ornithologists Union Official Checklist of the Birds of Australia (1926) and subsequent amendments.

No mention is made of subspecies, but it may be remarked that a number of forms originally described as full species will eventually be recognised merely as well-marked geographical races of familiar species in adjacent regions.

Dromaius novae-hollandiae: Emu.
Megapodius reinwardt: Scrub-Fowl.
Leipoa ocellata: Mallee-Fowl.
Coturnix pectoralis: Stubble Quail.
Synoicus australis: Brown Quail.
Excalfactoria chinensis: King Quail.
Turnix maculosa: Red-backed Quail.
Turnix castanota: Chestnut-backed Quail.
Turnix velox: Little Quail.
Turnix pyrrhothorax: Red-chested Quail.
Ptilinopus ewingi: Rose-crowned Pigeon.
Leucotreron alligator: Black-banded Pigeon.
Myristicivora spilorrhoa: Torres Strait Pigeon.
Macropygia phasienella: Brown (Pheasant) Pigeon.
Geopelia placida: Peaceful Dove.
Geopelia cuneata: Diamond Dove.
Geopelia humeralis: Bar-shouldered Dove.
Chalcophaps chrysochlora: Green-winged Pigeon.
Phaps chalcoptera: Common Bronzewing.
(?) **Phaps elegans:** Brush Bronzewing.
Recorded by S. A. White from the region of Daly Waters (1923).
Histriophaps histrionica: Flock-Pigeon.
Petrophassa albipennis: White-quilled Rock-Pigeon.
Petrophassa rufipennis: Chestnut-quilled Rock-Pigeon.
Geophaps scripta: Squatter-Pigeon.
Geophaps smithi: Partridge-Pigeon.
Lophophaps plumifera: Plumed Pigeon.
Ocyphaps lophotes: Crested Pigeon.
Hypotaenidea philippensis: Banded Landrail.
Porzana plumbea: Spotless Crake.

Poliolimnas cinereus: White-browed Crake.
Amaurornis ruficrissus: Bushen.
Tribonyx ventralis: Black-tailed Native-Hen.
Porphyrio melanotus: Eastern Swamphen.
Fulica atra: Coot.
Podiceps cristatus: Great Crested Grebe.
Podiceps ruficollis: Little Grebe (Dabchick).
Fregata minor: Greater Frigate-Bird.
Fregata ariel: Lesser Frigate-Bird.
Phalacrocorax carbo: Black Cormorant.
Phalacrocorax sulcirostris: Little Black Cormorant.
(?) **Phalacrocorax fuscescens**: White-breasted Cormorant. Recorded in error from Finke R. and Palm Valley by F. L. Whitlock (1924).
Phalacrocorax varius: Pied Cormorant.
Microcarbo melanoleucus: Little Pied Cormorant.
Anhinga novae-hollandiae: Australian Darter.
Sula leucogaster: Brown Gannet (Booby).
Sula sula: Red-footed Gannet.
Sula dactylatra: Masked Gannet.
Pelecanus conspicillatus: Australian Pelican.
Phaethon rubricaudus: Red-tailed Tropic-Bird.
Phaeton lepturus: White-tailed Tropic-Bird.
Chlidonias leucoptera: White-winged Black Tern.
Chlidonias leucopareia: Whiskered (Marsh) Tern.
Gelochelidon nilotica: Gull-billed Tern.
Hydroprogne caspia: Caspian Tern.
Sterna dougalli: Roseate Tern.
Sterna bergii: Crested Tern.
Sterna bengalensis: Lesser Crested Tern.
Sterna albifrons: Little Tern.
Sterna sumatrana: Black-naped Tern.
Sterna fuscata: Sooty Tern.
Sterna anaetheta: Bridled Tern.
Anous stolidus: Noddy.
Anous minutus: White-capped Noddy.
Larus novae-hollandiae: Silver Gull.
Haematopus ostralegus: Pied Oyster-catcher.
Haematopus unicolor: Sooty Oyster-catcher.
Erythrogonys cinctus: Red-kneed Dotterel.
Lobibyx miles: Masked Plover.
Zonifer tricolor: Banded Plover.
Charadrius leschenaulti: Large Sand-Dotterel.
Charadrius veredus: Oriental Dotterel.
Charadrius ruficapillus: Red-capped Dotterel.
Charadrius melanops: Black-fronted Dotterel.
Himantopus leucocephalus: White-headed Stilt.
Recurvirostra novae-hollandiae: Red-necked Avocet.
Numenius cyanopus: Eastern Curlew.
Numenius phaeopus: Whimbrel.
Mesoscolopax minutus: Little Whimbrel.
Limosa limosa: Black-tailed Godwit.
Limosa lapponica: Bar-tailed Godwit.
Tringa glareola: Wood-Sandpiper.
Tringa brevipes: Grey-tailed Tattler.
Tringa hypoleuca: Common Sandpiper.
Tringa nebularia: Greenshank.
Tringa stagnatilis: Marsh-Sandpiper.
Xenus cinerea: Terek Sandpiper.
Erolia ruficollis: Red-necked Stint.
Erolia acuminata: Sharp-tailed Sandpiper.
Limicola falcinella: Broad-billed Sandpiper.
Gallinago megala: Pin-tailed Snipe.
Irrediparra gallinacea: Lotus-Bird (Jacana).
Stiltia isabella: Australian Pratincole.
Burhinus magnirostris: Southern Stone-Curlew.
Orthorhamphus magnirostris: Beach Stone-Curlew.
Eupodotis australis: Australian Bustard (Plain Turkey).
Grus rubicundus: Brolga (Native Companion).
Plegadis falcinellus: Glossy Ibis.
Threskiornis molucca: White Ibis.
Threskiornis spinicollis: Straw-necked Ibis.
Platalea regia: Royal Spoonbill:
Platalea flavipes: Yellow-billed Spoonbill.
Xenorhynchus asiaticus: Jabiru (Black-necked Stork).
Ardea sumatrana: Great-billed Heron.
Egretta garzetta: Little Egret.
Egretta intermedia: Plumed Egret.
Egretta alba: White Egret.
Notophoyx novae-hollandiae: White-faced Heron.
Notophoyx pacifica: Pacific Heron.
Notophoyx aruensis: Pied Heron.
Demigretta sacra: Reef Heron.
Nycticorax caledonicus: Nankeen Night Heron.
Butorides striata: Mangrove Heron.
Ixobrychus minutus: Little Bittern.
Dupetor flavicollis: Black Bittern.
Anseranas semipalmata: Pied Goose.
Chenonetta jubata: Maned Goose.
Nettapus pulchellus: Green Pygmy-Goose.
Dendrocygna arcuata: Whistling Tree-Duck.
Dendrocygna eytoni: Plumed Tree-Duck.
Tadorna radjah: White-headed Shelduck (Burdekin Duck)
Anas superciliosa: Grey (Black) Duck.
Querquedula gibberifrons: Grey Teal.
Querquedula castanea: Chestnut Teal.
Malacorhynchus membranaceus: Pink-eared Duck.
Nyroca australis: Hardhead (White-eyed Duck).
Circus assimilis: Spotted Harrier.
Circus approximans: Swamp Harrier.
Astur novae-hollandiae: Grey Goshawk.
Astur fasciatus: Goshawk.
Accipiter cirrhocephalus: Collared Sparrowhawk.
Erythrotriorchis radiatus: Red Goshawk.
Uroaetus audax: Wedge-tailed Eagle.
Hieraetus morphnoides: Little Eagle.
Haliaetus leucogaster: White-breasted Sea-Eagle.
Haliastur indus: Red-backed Sea-Eagle.
Haliastur sphenurus: Whistling Eagle.
Milvus migrans: Black (Fork-tailed) Kite.
Lophoictinia isura: Square-tailed Kite.
Hamirostra melanosterna: Black-breasted Buzzard.
Elanus axillaris: Black-shouldered Kite.
Elanus scripta: Letter-winged Kite.
Baza subcristata: Crested Hawk.
Falco longipennis: Little Falcon.
Falco hypoleucus: Grey Falcon.
Falco peregrinus: Peregrine Falcon.
Falco subniger: Black Falcon.
Falco berigora: Brown Hawk.
Falco cenchroides: Nankeen Kestrel.
Pandion haliaetus: Osprey.
Ninox boobook: Boobook Owl.
Ninox ocellata: Northern Boobook Owl.
Ninox connivens: Winking Owl.
Ninox rufa: Rufous Owl.
Tyto alba: Barn Owl.
Tyto novae-hollandiae: Masked Owl.
Tyto longimembris: Eastern Grass Owl.
Trichoglossus rubritorquis: Red-collared Lorikeet.
Psitteuteles versicolor: Varied Lorikeet.
Calyptorhynchus banksi: Red-tailed Black Cockatoo.
Kakatoe galerita: White Cockatoo.
Kakatoe leadbeateri: Pink Cockatoo (Major Mitchell).
Kakatoe sanguinea: Little Corella (Bare-eyed Cockatoo).
Kakatoe roseicapilla: Galah.
Leptolophus hollandicus: Cockatiel (Cockatoo Parrot).
Polytelis alexandrae: Princess-Parrot.
Aprosmictus erythropterus: Red-winged Parrot.
(?) **Platycercus adscitus**: Pale-headed Rosella. Probably in error—loc. Darwin (vide LeSouef, 1903).
Platycercus venustus: Northern Rosella.
Barnardius zonarius: Port Lincoln Parrot.
Psephotus dissimilis: Hooded Parrot.
Psephotus varius: Mulga Parrot.
Neophema bourki: Bourke Parrot.
Melopsittacus undulatus: Budgerygah (Shell-Parrot).
Geopsittacus occidentalis: Night Parrot.
Podargus strigoides: Tawny Frogmouth.
Aegotheles cristata: Owlet-Nightjar.
Eurystomus orientalis: Eastern Broad-billed Roller (Dollar-Bird).
Alcyone azurea: Azure Kingfisher.
Alcyone pusilla: Little Kingfisher.
Dacelo gigas: Laughing Kookaburra.
Dacelo leachi: Blue-winged Kookaburra.
Halcyon macleayi: Forest-Kingfisher.
Halcyon pyrrhopygius: Red-backed Kingfisher.
Halcyon sanctus: Sacred Kingfisher.
Halcyon chloris: Mangrove Kingfisher.
Merops ornatus: Rainbow-Bird, Australian Bee-eater.
Eurostopodus guttatus: Spotted Nightjar.
Eurostopodus mystacalis: White-throated Nightjar.
Caprimulgus macrurus: Large-tailed Nightjar.
Hirundapus caudacutus: Spine-tailed Swift.
Apus pacificus: Fork-tailed Swift.
Cuculus optatus: Oriental Cuckoo.
Cuculus pallidus: Pallid Cuckoo.
Cacomantis pyrrhophanus: Brush (Square-tailed) Cuckoo.
Owenavis osculans: Black-eared Cuckoo.
Chalcites basalis: Horsfield Bronze-Cuckoo.
Lamprococcyx plagosus: Golden Bronze-Cuckoo.
Lamprococcyx minutillus: Little Bronze-Cuckoo.
Eudynamys orientalis: Koel (Cooee-Bird).
Scythrops novae-hollandiae: Channel-billed Cuckoo.
Centropus phasianinus: Pheasant Coucal.
Pitta iris: Rainbow Pitta.
Cheramoeca leucosterna: White-backed Swallow.
Hylochelidon nigricans: Tree-Martin.
Hylochelidon ariel: Fairy Martin.
Rhipidura flabellifera: Grey Fantail.
Rhipidura rufifrons: Rufous Fantail.
Rhipidura setosa: Northern Fantail.
Rhipidura leucophrys: Willie Wagtail.

Myiagra rubecula: Leaden Flycatcher.
Myiagra ruficollis: Broad-billed Flycatcher.
Seisura inquieta: Restless Flycatcher.
Piezorhynchus alecto: Shining Flycatcher.
Microeca fascinans: Jacky Winter.
Microeca brunneicauda: Brown-tailed Flycatcher.
Miroeca flavigaster: Lemon-breasted Flycatcher.
Petroica goodenovii: Red-capped Robin.
Melanodryas cucullata: Hooded Robin.
Quoyornis leucurus: Mangrove-Robin.
Poecilodryas superciliosa: White-browed Robin.
Poecilodryas cerviniventris: Buff-sided Robin.
Pachycephala robusta: Robust Whistler.
Pachycephala melanura: Black-tailed Whistler.
Pachycephala rufiventris: Rufous Whistler.
Pachycephala lanioides: White-breasted Whistler.
Pachycephala simplex: Brown Whistler.
(?) **Colluricincla harmonica**: Grey Shrike-Thrush. Recorded from Groote Eylandt by Tindale; record based on call, probably in error; bird heard probably the following species.
Colluricincla brunnea: Brown Shrike-Thrush.
Colluricincla rufiventris: Western Shrike-Thrush.
Colluricincla woodwardi: Brown-breasted Shrike-Thrush.
Colluricincla parvula: Little Shrike-Thrush.
Grallina cyanoleuca: Magpie-Lark.
Falcunculus whitei: Northern Shrike-Tit.
Oreoica gutturalis: Crested Bellbird.
Sphenostoma cristatum: Wedgebill.
Pteropodocys maxima: Ground Cuckoo-Shrike.
Coracina novae-hollandiae: Black-faced Cuckoo-Shrike.
Coracina hypoleuca: White-breasted Cuckoo-Shrike.
Edoliisoma tenuirostre: Jardine Caterpillar-eater.
Lalage tricolor: White-winged Triller.
Lalage leucomela: Varied Triller.
Sphecotheres flaviventris: Yellow Figbird.
Cinclosoma cinnamomeum: Cinnamon Quail-Thrush.
Cinclosoma castaneothorax: Chestnut-breasted Quail-Thrush.
Drymodes superciliaris: Northern Scrub-Robin.
Pomatostomus rubeculus: Red-breasted Babbler.
Epthianura tricolor: Crimson Chat.
Epthianura aurifrons: Orange Chat.
Pomatostomus superciliosus: White-browed Babbler.
Epthianura crocea: Yellow Chat.
Gerygone olivacea: White-throated Warbler.
Gerygone magnirostris: Large-billed Warbler.
Gerygone chlorgnota: Green-backed Warbler.
Gerygone levigaster: Buff-breasted Warbler.
Gerygone fusca: Western Warbler.
Smicrornis flavescens: Yellow Weebill.
Aphelocephala leucopsis: Eastern Whiteface.
Aphelocephala castaneiventris: Western Whiteface.
Aphelocephala pectoralis: Chestnut-breasted Whiteface.
Aphelocephala nigricincta: Banded Whiteface.
Acanthiza pusilla: Brown Thornbill.
Acanthiza robustirostris: Robust Thornbill.
Acanthiza uropygialis: Chestnut-tailed Thornbill.
Acanthiza chrysorrhoa: Yellow-tailed Thornbill.
Pyrrholaemus brunneus: Redthroat.
Cinclorhamphus cruralis: Brown Songlark.
Cinclorhamphus mathewsi: Rufous Songlark.
Amytornis textilis: Western Grass-Wren.
Amytornis purnelli: Dusky Grass-Wren.
Amytornis modestus: Thick-billed Grass-Wren.
Amytornis striatus: Striated Grass-Wren.
Amytornis whitei: Rufous Grass-Wren.
Amytornis woodwardi: White-throated Grass-Wren.
Amytornis dorothea: Dorothy Grass-Wren.
Megalurus galactotes: Tawny Grass-Bird.
Acrocephalus australis: Reed-Warbler.
Cisticola exilis: Golden-headed Fantail-Warbler.
Stipiturus ruficeps: Rufous-crowned Emu-Wren.
Malurus callainus: Turquoise Wren.
Malurus leuconotus: Blue and White Wren.
Malurus assimilis: Purple-backed Wren.
Malurus melanocephalus: Red-backed Wren.
Rosina coronata: Purple-crowned Wren.
Artamus leucorhynchus: White-rumped Wood-Swallow.
Artamus personatus: Masked Wood-Swallow.
Artamus superciliosus: White-browed Wood-Swallow.
Artamus melanops: Black-faced Wood-Swallow.
Artamus minor: Little Wood-Swallow.
Neositta leucoptera: White-winged Sittella.
Climacteris affinis: White-browed Tree-creeper.
Climacteris melanura: Black-tailed Tree-creeper.
Dicaeum hirundinaceum: Mistle-toe Bird.
Pardalotus ornatus: Red-tipped Pardalote.
Pardalotus melanocephalus: Black-headed Pardalote.
Pardalotus rubricatus: Red-browed Pardalote.
Zosterups lutea: Yellow Silvereye.
Melithreptus albogularis: White-throated Honeyeater.
Melithreptus laetior: Golden-backed Honeyeater.
Myzomela erythrocephala: Red-headed Honeyeater.
Myzomela pectoralis: Banded Honeyeater.
Myzomela obscura: Dusky Honeyeater.
Gliciphila fasciata: White-breasted Honeyeater.
Gliciphila albifrons: White-fronted Honeyeater.
Gliciphila indistincta: Brown Honeyeater.
Grantiella picta: Painted Honeyeater.
Lacustroica whitei: Grey Honeyeater.
Conopophila albogularis: Rufous-banded Honeyeater.
Conopophila rufogularis: Rufous-throated Honeyeater.
Certhionyx variegatus: Pied Honeyeater.
Meliphaga albilineata: White-lined Honeyeater.
Meliphaga virescens: Singing Honeyeater.
Meliphaga keartlandi: Grey-headed Honeyeater.
Meliphaga plumula: Yellow-fronted Honeyeater.
Meliphaga flavescens: Yellow-tinted Honeyeater.
Meliphaga penicillata: White-plumed Honeyeater.
Meliphaga flava: Yellow Honeyeater.
Stomiopera unicolor: White-gaped Honeyeater.
Myzantha flavigula: Yellow-throated Miner.
Acanthagenys rufogularis: Spiny-cheeked Honeyeater.
Entomyzon cyanotis: Blue-faced Honeyeater.
Philemon gordoni: Melville Island Friar-bird.
Philemon argenticeps: Silver-crowned Friar-bird.
Philemon citreogularis: Little Friar-bird.
Anthus australis: Pipit (Groundlark).
Mirafra javanica: Horsfiels Bushlark.
Taeniopygia castanota: Zebra (Chestnut-eared) Finch.
Emblema picta: Painted Finch.
Steganopleura bichenovii: Banded (Double-bar) Finch.
Steganopleura annulosa: Black-ringed Finch.
Donacola castaneothorax: Chestnut-breasted Finch.
Donacola flaviprymna: Yellow-tailed Finch.
Donacola pectoralis: Pictorella Finch.
Bathilda ruficauda: Star (Red-faced) Finch.
Neochmia phaeton: Crimson Finch.
Poephila acuticauda: Long-tailed Finch.
Poephila personata: Masked Finch.
Poephila gouldiae: Gouldian Finch.
Oriolus sagittatus: Olive-backed Oriole.
Oriolus flavocinctus: Yellow Oriole.
Chibia bracteata: Spangled Drongo.
Struthidea cinerea: Apostle-Bird.
Chlamydera guttata: Western Bower-Bird.
Chlamydera nuchalis: Great Bower-Bird.
Corvus cecilae: Australian Crow.
Cracticus nigrogularis: Pied Butcher-Bird.
Cracticus quoyi: Black Butcher-Bird.
Cracticus torquatus: Grey Butcher-Bird.
Gymnorhina tibicen: Black-backed Magpie.
Gymnorhina hypoleuca: White-backed Magpie.

MR. J. M. BLACK.

At a general meeting held on February 22, 1945, Mr. J. M. Black was presented with the Natural History Medallion awarded annually by the Victorian Field Naturalists' Society for the most outstanding contribution to Natural History in Australia for the year. Dr. Charles Fenner, Director of Education, made the presentation, and in doing so expressed his admiration for the valuable work done by this great botanist. Mr. Black's revision of his own "Flora of South Australia," part I, published in 1944, was the work actually cited as the outstanding contribution to science for which the award was made.

The Ascent of Mt. Lofty by Captain Barker

By J. B. CLELAND.

The following is from Captain Sturt's 'Two Expeditions into the Interior of Southern Australia,' Second Edition, II, p. 232. The part in brackets are my suggestions or comments.

17th April, 1831. 'The boat went to the place at which they had before landed (Pt. Noarlunga?), as they thought they had discovered a small river with a bar entrance. They crossed the bar, and ascertained that it was a narrow inlet, of four miles in length, that terminated at the base of the ranges . . . A rocky glen made a cleft in the ranges at the head of the inlet. . . . In the morning, Captain Barker proceeded to ascend Mt. Lofty, accompanied by Mr. Kent and his servant, leaving the two soldiers at the bivouac (Noarlunga?) . . . Mr. Kent says they kept the ridge all the way, and rose above the sea by a gradual ascent. . . . The view to the eastward was shut out by other ranges, parallel to those on which they were; below them to the westward, the same pleasing kind of country that flanked the inlet still continued (? via Morphett Vale, Happy Valley, Blackwood or further eastward).

In the course of the day, they passed round the head of a deep ravine, whose smooth and grassy sides presented a beautiful appearance. The party stood 600 feet above the bed of a small rivulet that occupied the bottom of the ravine (Waterfall Gully ?). In some places huge blocks of granite (!) interrupted its course, in others the waters had worn the rock smooth. The polish of these rocks was quite beautiful, and the veins of red and white quartz which traversed them looked like mosaic work. They did not gain the top of Mt. Lofty, but slept a few miles beyond the ravine. In the morning they continued their journey, and, crossing Mt. Lofty, descended northerly, to a point from which the range bent away a little to the N.-N.-E., and then terminated (!) (? hill over Morialta on Norton Summit Road). The view from this point was much more extensive than that from Mt. Lofty itself. They overlooked a great part of the gulf, and could distinctly see the mountains at the head of it to the N.-N.-W. . . . A mountain, very similar to Mt. Lofty, bore due east of them, and appeared to be the termination of its range. They were separated by a valley of about ten miles in width, the appearance of which was not favorable. Mr. Kent states to me that Capt. Barker observed at the time that he thought it probable I had mistaken this hill for Mt. Lofty, since it shut out the view of the lake from him, and therefore he naturally concluded I could not have seen Mt. Lofty. . . . I have corrected it in the charts, and have availed myself of the opportunity thus afforded me of perpetuating . . . the name of an inestimable companion in Captain Barker himself. . . .

Captain Barker again slept on the summit of the range, near a large basin that looked like the mouth of a crater, in which huge fragments of rocks made a scene of the utmost confusion. These rocks were a coarse grey granite (!). Mr. Kent remarks that it superseded the schistone formation at the ravine we have noticed. . . . Mr. Kent says they were surprised at the size of the trees on the immediate brow of it. . . . The party rejoined the soldiers on the 21st.'

What was the route followed by Captain Barker? After many inspections of the locality, I suggest the following. The party clearly entered the Onkaparinga and rowed up as far as what is now Noarlunga. Leaving here, my interpretation is that Captain Barker kept along the foothills near Morphett Vale and then those at the back of Happy Valley, crossed the Sturt near the old road to Blackwood, or nearer the sea, continued on to Blackwood and Belair, keeping in sight of the sea, then crossed down into Brownhill Creek and up the other side to reach the hills above Glen Osmond, and thence proceeded to the Eagle-on-the-Hill and above Waterfall Gully (which he described graphically but erroneously). He then either made straight for the summit now visible or followed round the ridge which carries the road to the top. Thence he made his way either to the hill above Stonyfell Quarry or to the one south of Morialta.

Can anyone suggest a more likely route? (E.g. from Belair to Waverley Ridge and round to Waterfall Gully before making for the summit. Mt. Lofty itself is clearly visible from the Blackwood ridge, and if he made direct for this, he would probably go along the ridge which bounds the north side of National Park.)

SEA FAN

By BERNARD C. COTTON.

The beautiful Sea Fan reproduced on the front cover was forwarded to the South Australian Museum for identification by Mr. H. Pillar, Headmaster of the Kingston Public School, in the South-East of South Australia. It belongs to the family of eight-rayed corals scientifically known as Gorgoniidae, horny, tree, and bush-like growths covered with numerous eight-rayed anemone-like creatures which are the polyps secreting the horny branches beneath their bases. The Sea Fans sometimes branch in all directions, at others only in one plane as in the present species, *Mopsella clavigera* Ridley 1884. Here the branches are lemon yellow to brick red and the polyps are retracted into slightly projecting verrucae scattered over the surface of stem and branches, but usually wanting on a median space on the posterior aspect of the colony. The species has been recorded from various localities all round the Australian coast-line in shallow water and down to 56 fathoms, except South Australia, so that this specimen from shallow water off Kingston constitutes a definite record for the State. Clinging to the branches are two South Australian Basket Stars of the species *Astroconus australis* Verrill 1876, belonging to the family Gorgonocephalidae. The original five rays of the stars split up at the tips into numerous smaller rays, which apparently find a good anchorage in the branches of the Sea Fan. All Sea Fans are attached, and Basket Stars, Brittle Stars, and Gastropod Molluscs climb the branches in search of food or attack the polyps. Mollusc eggs and sharks' eggs are sometimes attached to the branches. Other Eight Rayed Polyps of the Order Octactina are the Sea Pens and the Organ Pipe Corals.

The Farmers' Feathered Friends

By P. J. CURNOW.

Although all insect-eating birds are friends of the man on the land, there is a tendency on the part of most landowners to place little value on their services to them. Most cultivators of the soil have never troubled to give the matter serious thought; yet the close student of birds and their habits is fully aware of their usefulness in checking the spread of all noxious insects that ravage crops and plants. Were the subject better understood the writer is convinced that most men on the land would encourage and support those who advocate the protection of our feathered friends. Unfortunately, too many landowners are utterly indifferent to the just claims of the birds. When that beautiful little feathered creature the quail comes into their stubbles some are too prone to permit their slaughter by gun butchers who, under an obsolete Act, are allowed to shoot down forty of these useful little birds every day during an extended open season. Does the average farmer ever trouble to find out why these birds come into lucerne and stubble fields in the autumn? The writer is afraid not. Here is a concrete case showing the service quails rendered one lucerne grower of his acquaintance. An alleged "sport" visited this man's lucerne paddock one autumn bent on shooting all the quails which had appeared in large numbers, which a foolish law allowed. After the matter came to this writer's knowledge he protested vigorously to his friend against permission of this wanton killing. About this time the lucerne, covering many acres, became very sick. Upon a close investigation the owner found the whole area infested with a small brown grub. On examination of several quails' crops, they were found to contain very large numbers of these grubs. An instant stop was put to all shooting. The presence of these grubs accounted for the coming of the quails.

Many farmers themselves do not place any value on the useful birds that are permanent tenants such as those most useful of all birds, the common magpie, Murray magpie, the

quaint old laughing Jack (who has something to laugh about even in these difficult times), the plovers, and many others. These farmers will permit bird stealers in the nesting season to take young Jacks and other birds from their properties without even a protest.

In other countries this question of bird protection is better understood, and useful birds are more highly valued. Some five years ago a scientific survey was made of the useful bird life of the State of Iowa, U.S.A. It was estimated that there were 28,000,000 birds in that State alone helping farmers to produce better crops. The value of the service thus rendered to men on the land by these feathered friends could not be estimated and the billions of noxious insects consumed by such an army would have made the production of any crop impossible without their help.

No country in the world permitted the wicked and wanton destruction of its native bird and animal life in the early days of settlement more than the U.S.A.; and no country to-day spends more in an effort to control, through the medium of chemical sprays, the countless hordes of injurious insects of many types that ravage crops of all kinds.

The greatest vandal in the world is the white man. He comes into a new country clothed with valuable forests, strange forms of bird and animal life and often aboriginal life of a lower type than his own. What does he do? The first thing he thinks of is to kill off any living thing he can eat or, through the sale of furs or feathers, he can turn into cash. With no thought for the morrow he will take his axe and destroy valuable timber just to make a few blades of grass grow, where formerly little grew before. Luckily he has to pay a penalty when he upsets the balance of nature as he always does. The destruction of the bird life which formerly kept insect pests in check, means a higher cost in crop production by artificial means. When he slaughters wholesale the trees that by the annual dropping of their bark and leaves prevented soil erosion, particularly in hilly country, he again pays a penalty for following a mistaken policy. The original owner, the aborigine, knew better. He killed for use and was careful to preserve a balance between consumption and supply. In countless centuries he failed to exterminate the native fauna and avi-fauna. The white man, with his guns, snares, traps and poison, and no regard for the future, may be depended upon to exterminate whole species of birds and animals in a comparatively short time, although some varieties of birds and animals may appear to be in inexhaustible numbers. The case of the passenger pigeon in the United States is well known to ornithologists. During the last century at a late period these beautiful and harmless birds existed in millions. They nested in whole colonies in certain forests in eastern States. The little creatures, unfortunately for them, had a small edible body. In the nesting season, people turned out in large numbers, bringing barrels and tubs. The nests were raided and the young squabs were salted in countless thousands. This raiding went on for years, and what happened? Six years ago the last passenger pigeon died in the New York Zoo. Although a bird lover offered thousands of dollars for a mate for this little bird when living, not one could be found. The species is now extinct. This is the fate of all ground-nesting birds in this country, for apart from the senseless slaughter by gun butchers, the fox is the most destructive agent. Already the curlews, quails, larks—including our beautiful skylark—have been exterminated by foxes in this district.

Although the landowner himself is too often prone to take a hand in shooting harmless and useful birds (let a wild duck drop down on some farmers' dams and see what happens), the town dweller, obsessed with a desire to "go out and kill something," is too often the worst offender. Before the war, this pest drove out from his local town armed with a shotgun. He shot at anything: the magpies along the roads, plovers around a dam or water trough, anything in fact clothed with feathers; and, failing birds, a pot shot at a water tank on a stand helped to let off a desire to shoot something. This characteristic seems to be innate in many Australians, a trait handed down from their progenitors.

At a certain period last century, a Frenchman, dealing with British character, referred to the Briton's desire to kill even inoffensive creatures. He said:—"The average Englishman gets up in the morning, he throws open

his casement window and looks out and says, 'It's a fine morning, let's go out and kill something.'" It is this writer's opinion that we have amongst us many people of the same type.

A PLEA FOR SOME OF OUR NATIVE BIRDS

Before concluding, let us glance at the characteristics of some of the common birds usually destroyed on sight without attempting to sheet home to them the alleged crimes against them.

The Australian eagle is our greatest flying bird. That some eagles take lambs cannot be denied. If the great birds are caught in the act, by all means, in self protection, shoot them. On the other hand, why shoot birds of this type unless there is proof that they are lamb killers? The writer affirms that throughout the year eagles do more good in rabbit-infested country than harm. Up to forty-two rabbit remains have been found in this district around one nest in one week. Although sheep had grazed in the paddock where the tree containing the nest stood for many years, there was not one lamb or sheep remnant in or around the nest. In another case of the writer's knowledge, a pair of eagles nested on a local grazier's property for many years, and never in all that time had the owner of the property any reason to suspect that these great birds were interfering with his sheep or lambs. Dead rabbit remains were constantly found on the ground around the nest.

A word for our cockatoos. In difficult times, through drought, these birds come south in great numbers, and can become very destructive to germinating crops. In the present season in some districts much damage has resulted from the pink cockatoos digging up germinating wheat plants. Although these birds do little harm in normal years, landowners this season are quite justified in substantially reducing their numbers. The white cockatoo can in some seasons become most destructive, but, like the pink-breasted one, in an average season these birds do more good than harm by eating up much useless weed seeds.

Here is a case in point. A grazier and farmer not far from this town allowed a paddock to go out of cultivation for several seasons. Paddy melons took possession, and after three seasons this pest over-ran the whole paddock, largely spoiling it for grazing purposes. After frost had killed the melon vines the paddock was littered with thousands of yellow melons. A large mob of white cockatoos turned up. They broke open the melons and ate up the seed. After many weeks an inspection showed that no seed remained. This was a very great help to the landowner and saved expense in destroying the melons.

The greatest scavenger among common birds is the magpie. He forages all day long, eating up every kind of creeping and noxious insect, and should be protected by all men on the land, as one of their best feathered friends.

To conclude, before seizing a gun to shoot any bird that may be strange to you, attempt to find out if it be a useful species before you take its life. The greater number of our birds are useful, from the tiny wrens that eat up aphis on our roses to the larger kinds that help to control blow-fly strike by eating up fly larvae in dead carcases. All have a place in our economy and are worthy of preservation.

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BRANCH CLUBS OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA, INC.

The Conchology Club, once known as the Malacological Society, also the Botany Club, have proved so successful in the past that to meet the wishes of members, especially the Junior Members of the Society who desire to emphasise the study of one branch of Natural History, or for those who are particularly interested in "Sermons in stones and books in running brooks," a Geology Club was formed last year (1944).

This year (1945), to meet the needs of a number of members who wish to learn more about the Native Fauna of Australia, a Zoology Club has been created. The enthusiasm shown at the inaugural meeting speaks well for the success of this club, and already members have commenced a systematic series of studies.

Maybe we shall develop more than one prominent Geologist and Zoologist in the near future.

Large oaks grow from tiny acorns.

A Stranded School of Whales

By HERBERT M. HALE, Director South Australian Museum.

On October 5, 1944, Mr. E. E. King, of Two Wells, South Australia, reported that about 200 large "fish" had been stranded at Port Prime, in St. Vincent Gulf, and 30 miles or so north of Adelaide. Through the courtesy of the Editor of the "News" (to whom we are indebted for the accompanying pictures), the Chairman of the Museum Board (Professor T. Harvey Johnston), the Conchologist (Mr. B. C. Cotton) and the writer were enabled to visit the spot next day. As had been suspected from the description, the animals proved to be whales.

It was a sorry sight to see these huge creatures strewn along several miles of the soft beach. Most were dead; some were still gasping—long-drawn breaths of exhaustion and distress. A couple of them were vigorously threshing with their tails, and so forming deep hollows in the sand.

Whales, of course, are true mammals, and so, just like ourselves, have lungs, very large in their case, to enable them to "hold their breath" for long periods during their submarine foraging. The nostril, paired or single, has been pushed back to the top of the head, so that the animal may more readily breathe on coming to the surface; under most conditions it is necessary for the whale to keep moving at the surface in order to keep the nostril free of water. When submerged, the nostril is closed by a tightly-fitting valve, and this could be seen in operation in the dying whales.

Another feature worthy of note is that in these creatures the fat of the body occurs immediately below the skin, forming a blanket-like layer, known as blubber, which assists to retain the heat of the warm-blooded animals. Whales, although air breathers, soon die when stranded. The usually dark skin, in the case of the whales concerned jet black all over, absorbs the heat of the sun; huge blisters are raised even while the creature is still alive. The tongue swells and blackens, and oil soon commences to bubble out from the skin. In addition to this uncomfortable condition, the huge weight presses on the lungs, and so the animal is slowly suffocated. The rib bones are lighter in structure than in land animals, and do not form such a rigid support.

Broadly speaking, whales may be divided into two groups—those which have no permanent teeth, and develop plates of baleen, which hang from the roof of the mouth, and those which retain at least one pair of teeth throughout life. The former, the whalebone whales, feed upon small crustaceans, etc., which swim in myriads at the surface of the sea. The toothed whales feed upon larger prey.

What sort of whale was this we had come to see? On the way to Port Prime there were all sorts of conjectures, but to the zoologists, on arrival, it was a familiar friend after all—the Blackfish, or Pilot Whale (*Globicephalus ventricosus*) of our coasts, and a form widely distributed in tropical and temperate seas. Members of this species attain a length of about 20 feet, and carry teeth in both upper and lower jaws. Our chairman recalled the fact that on the way to the Antarctic with Sir Douglas Mawson he had often seen them surging out from the sides of the huge swells to the south of Australia. The writer recalled a similar stranding in South Australia, on a much smaller scale, many years ago.

Some measurements and notes concerning the specimens were taken, and Professor Harvey Johnston improved the shining hour (if not the atmosphere of the car on the way home) by searching through the digestive tracts of one or two specimens for parasitic worms. The conchologist secured photographs of the herd, his interest in the creatures being mainly centred on the fact that toothed whales feed largely upon squids and cuttlefish, which form part of his special studies.

A week after our visit to Port Prime it was discovered that a further fifty specimens were stranded about a mile and a half farther north than the main stranding, while isolated whales were reported along a twenty-mile stretch of beach between Port Parham and Port Gawler.

At Port Prime the tide, when low, recedes from the low fringing sandhills for a distance of about two miles, and the whales were lying on the extensive sand flats so uncovered. A deep channel leads into these flats, and it is possible that the whales followed this "run" inshore, and got into difficulties on the flats as the tide dropped.

Strandings of Pilot Whales have been observed in many parts of the world, however, and, as in the present case, the beached examples do not necessarily exhibit any sign of injury or disease, so that the reason for their coming ashore, particularly in large numbers and over a long stretch of coast-line, is difficult to account for.

A large school of about 300 Pilot Whales was stranded near Stanley, north-western Tasmania, in October, 1935, and this, like the South Australian record here presented, is one of the largest strandings in history.

Strandings of large numbers of whales have intriguing possibilities, hence our interest. In 1929, for instance, 120 whales were noticed floundering helplessly in shallow surf inside Cape Peninsula, South Africa, and were eventually stranded, when, as in the present occurrence, they lay struggling and gasping in great distress for hours, until kindly death brought merciful release from their agonies. In this case the whales proved to be False Killers (*Pseudorca crassidens*), and the incident was of particular interest to scientists, as, until a few years before, this kind of whale was thought to be nearly extinct.

As mentioned above, however, our whales represented a widely distributed species. For centuries Blackfish were fished for in the Faroe Islands in the Northern Hemisphere, and the earliest date concerning the appearance of these whales there was in the year 1584. When a herd was discovered, the inhabitants rushed to their boats, and, drawing together in a half-circle round the school, herded them to a voe, a bay with a sloping bottom of mud or sand, preferably loose, so that the water readily became muddy, and the whales could not see a way out. When helpless in shallow water, they were killed with lances. Each specimen produced about a barrel of oil. The meat was dried or pickled by the islanders, and the stomachs inflated and made into buoys. Whale meat, it may be mentioned in passing, is a relished food in the United States.

The ancestors of whales were four-legged, land-dwelling animals, like horses, dogs, bears, and cats, but over long years of aquatic life have become modified for life in their new environment. The whole body is beautifully stream-lined. All external trace of the hind legs has completely disappeared, although the skeleton still retains vestiges of the pelvic girdle, and in some cases those of the leg bones also. The front legs are, like those of the seals, flipper-like, but if the flesh is removed from the limb, inside is found the five-fingered skeleton typical of the vertebrate animals. On top of the back a fleshy dorsal fin without internal skeleton is developed.

The outstanding features peculiar to mammals are, firstly, the fact that the young are suckled with milk produced by the mother, and secondly, that hair is present on at least some part of the body during at least some period of the life history. Whales suckle their young in the usual way, but the mammae are retractile, and may be perfectly folded beneath the skin, so as to preserve the stream-lined outer face. In so far as hair is concerned, it is very limited indeed, being reduced to one or two whiskers, which may be discernible only in the extremely young animal.

Strandings of single whales are really not uncommon in South Australia, and are always worth reporting. The skull of a rare Pigmy Whale cast ashore at Sleaford Bay, near Port Lincoln, has just been added to the Museum collection, as have also casts, etc., of a female and calf of this same small species, taken at Port Victoria (see S.A. Nat., 19, No. 4, 1939, p. 7); last year the writer saw a large Sperm Whale on the beach at Bridgewater Bay, in Victoria. Several rare Bottle-nosed Whales have been discovered during recent years, the most noteworthy example being a Southern Bottlenose (*Hyperoodon planifrons*) stranded at Port Victoria in December, 1929, as a complete example of this species has not been seen before. The skeleton hangs in the South Australian Museum, in company with that of a Blackfish and other small whales.

SOME OF THE BLACKFISH, OR PILOT WHALES, STRANDED AT PORT PRIME

PROF. HARVEY JOHNSTON, KING AND HALE, MEASURING A WHALE

VIEWING A STRANDED WHALE

Field Naturalists' Section

of the

Royal Society

(of South Australia,) Inc.

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Keyhole Limpet
Fissurellidae

GREEN TURTLE

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OCTOBER 15, 1945.

Registered at the G.P.O., Adelaide, for transmission through the post as a periodical.

The South Australian NATURALIST

JOURNAL OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Price : One Shilling.

Vegetation along centre of Spit with sandy beach sloping down to the sea.

Vegetation in detail. R—*Nitraria Schoberi;* L—*Atriplex cinereum;* back—*Nitraria* and *Lycium ferocissimum;* foreground — prostrate *Cakile* and *Cryophytum*

One end of Spit, a distant view showing the sandy beach and crown of vegetation.

ILLUSTRATIONS REFERRED TO ON PAGE 2 IN THE ARTICLE "PLANT COLONISATION OF A SANDSPIT," BY C. M. EARDLEY.

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THE SOUTH AUSTRALIAN NATURALIST

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Plant Colonisation of a Sandspit, Kangaroo Island

By C. M. EARDLEY.

At the north-eastern end of Kangaroo Island, in the Bay of Shoals within sight of the Town of Kingscote, is a sand-bar or reef about five miles long, known as 'The Spit.' It is not continuous above high tide level, but consists of perhaps four long, narrow segments arranged end to end in crescent formation. The Spit is uninhabited, though quite often visited by boating parties from Kingscote, only a few miles away. Sea-birds still breed there in large numbers.

In January, 1945, an opportunity occurred to visit the most sea-ward segment of the chain; it was obvious that the vegetation is in a comparatively natural state, at present, and deserves attention as an example of early colonisation of marine sand.

The strip visited is about 400 yards long and 50 yards wide, a line of vegetation some 16 yards wide clothes the flat backbone of the strip, which is flanked on either side by a broad, white, shelly beach sloping down to the sea; this beach forms a long, pointed tail at either end of the strip of spit, and has no vegetation. The flat centre of the strip is probably only just above high water level.

The vegetation is fairly dense, consisting chiefly of three species of bushes, 2 to 4 feet high, with bare sand between them. Each seems equally important: they are *Atriplex cinereum, Nitraria Schoberi,* and *Lycium ferocissimum* (Salt-bush, Nitre-bush, and Box-thorn respectively), all common coastal plants. Smaller herbaceous plants present were *Cakile maritima* (Sea Rocket) and *Cryophytum crystallinum* (*Mesembrianthemum crystallinum,* Ice Plant) alone, both littoral pioneers. There were no plants of the important pioneer grass of coastal sands, *Spinifex hirsutus,* though one fruit was seen: probably it is to be expected in the near future, and may already have a hold on other sections of the Spit not visited by the writer. The plants named are also characteristic of the Kingscote beaches.

The co-dominance of the introduced shrub, *Lycium* (Boxthorn), is most interesting and is a clear case of distribution by birds, which eat the red berries and scatter the seed.

Bird Migration in South Australia

By E. F. BOEHM, Sutherlands, S.A.

Our knowledge of the seasonal migratory movements of birds in Australia is extremely limited when compared with the position as regards bird migration in Europe and America. Marking of birds, particularly with numbered leg-rings, has been carried out as an important part of the investigations there, but nothing along these lines has as yet been attempted in Australia. One hopes that after the war properly organised research on our migratory birds, similar to work already carried out by European and American ornithologists, will be inaugurated here, including this State.

Meanwhile, a simple statement of our present knowledge of the status of migratory birds in South Australia would be helpful not only to ornithologists but to nature students generally.

In the classification of bird migrants given hereunder, the writer has endeavoured to fill the need with a tentative arrangement of species on the basis of their period of absence from the State. Considerable difficulty was experienced with certain species, and it is likely that a reclassification of some of these will become necessary when additional data comes to hand. Some species have been omitted because of insufficient data concerning them. The seasonal terminology employed is as follows: Summer—December 22 to March 21; Autumn—March 22 to June 21; Winter—June 22 to September 21; Spring—September 22 to December 21.

Except when otherwise stated the schedules apply to the normal haunts of species when in South Australia.

CLASSIFIED LIST

I. PALAEARCTIC MIGRANTS:

(a) Species absent during winter: Arctic Skua, *Stercorarius parasiticus.* Turnstone, *Arenaria interpres.* Grey Plover, *Squatarola squatarola.* Eastern Golden Plover, *Pluvialis dominicus.* Oriental Dotterel, *Charadrius veredus.* Little Whimbrel, *Mesoscolopax minutus.* Bar-tailed Godwit, *Limosa lapponica.* Wood-Sandpiper, *Tringa glareola.* Common Sandpiper, *T. hypoleuca.* Knot, *Calidris canutus.* Sanderling, *Crocethia alba.* Australian Snipe, *Gallinago hardwicki.* Spine-tailed Swift, *Hirundapus caudacutus.* Fork-tailed Swift, *Micropus pacificus.*

(b) Species of which only some non-breeding individuals remain during winter: Eastern Curlew, *Numenius cyanopus.* Whimbrel, *N. phaeopus.* Black-tailed Godwit, *Limosa limosa.* Greenshank, *Tringa nebularia.* Curley Sandpiper, *Erolia testacea.* Red-necked Stint, *E. ruficollis.* Sharp-tailed Sandpiper, *E. acuminata.*

II. SUB-ANTARCTIC AND NEW ZEALAND MIGRANTS:

(a) Species absent during spring: Southern Skua, *Catharacta skua lonnbergi.* Double-banded Dotterel, *Charadrius bicinctus.*

(b) Species of which only some non-breeding individuals remain during spring and summer: White-headed Petrel, *Pterodroma lessoni.* Giant Petrel, *Macronectes giganteus.* Cape Petrel, *Daption capense.* Wandering Albatross, *Diomedea exulans.* Black-browed Albatross, *D. melanophris.* Yellow-nosed Albatross, *D. chlororhyncha.*

(c) Species absent from mid-spring to mid-autumn: Medium-billed Prion, *Pachyptila salvini.* Dove Prion, *P. desolata.* Thin-billed Prion, *P. belcheri.* Fairy Prion, *P. turtur.*

III. AUSTRALIAN MIGRANTS:

(a) Species absent during winter: Short-tailed Shearwater, *Puffinus tenuirostris.* Fleshy-footed Shearwater, *P. carneipes.* Rainbow Bird, *Merops ornatus.* Channel-billed Cuckoo, *Scythrops novae-hollandiae.*

(b) Species generally absent during winter from districts receiving an average annual rainfall of more than 10 inches: Cockatiel, *Leptolophus hollandicus.* Budgerygah, *Melopsittacus undulatus.* Red-backed Kingfisher, *Halcyon pyrrhopygius.* Fairy Martin, *Hylochelidon ariel.* White-winged Triller, *Lalage tricolor.* Crimson Chat, *Epthianura tricolor.* Orange Chat, *E. aurifrons.* Rufous Songlark, *Cinclorhamphus mathewsi.* Masked Wood-Swallow, *Artamus personatus.* White-browed Wood-Swallow, *A. superciliosus.*

(c) Species absent during spring: Swift Parrot, *Lathamus discolor.* Flame Robin, *Petroica phoenicea.* Olive-backed Oriole, *Oriolus sagittatus.*

(d) Species absent during summer to mid-autumn from districts receiving an average annual rainfall of more than 10 inches: Black-eared Cuckoo, *Owenavis osculans.* Golden Bronze-Cuckoo, *Lamprococcyx plagosus.*

(e) Species of which only some stragglers remain during summer to mid-autumn in districts receiving an average annual rainfall of more than 10 inches: Pallid Cuckoo, *Cuculus pallidus.* Fan-tailed Cuckoo, *Cacomantis flabelliformis.* Horsfield Bronze-Cuckoo, *Chalcites basalis.*

FIRST HAND OBSERVATIONS.

By *FIELD NAT.*

The white cabbage butterfly *Pieris brassicae* which has become such a common feature in the vegetable garden, usually lays its eggs on the leaves of plants belonging to the cabbage tribe.

The plants that seem to be the favourite food of the green caterpillars belong to the order Cruciferae, which includes the genus *Brassica* and its several varieties:

Brassica oleracea capitata (the cabbage with a heart or head).

Brassica oleracea botrytis cauliflora (the cauliflower).

Brassica oleracea bullata gemmifera (the Brussels sprouts).

Brassica oleracea bullata major (the Savoy cabbage).

Brassica oleracea acephala (Borecole or kale).

Brassica oleracea caulorapa (kohl rabi).

Brassica rapa (rape).

Brassica oleracea botrytis asparagoides (Broccoli).

The caterpillar feeds also on the leaves of Horse radish (*Cochlearia amoracea*), which belongs to the order Cruciferae.

Another plant that is eaten by the caterpillars is the garden nasturtium (*Tropaeolum majus*), which strangely enough belongs to the order Geraniaceae.

The true Nasturtium is the watercress of our streams in the mountains.

Has the larva of this butterfly been seen eating any other plants?

SIXTY-FIRST ANNUAL REPORT OF THE COMMITTEE OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF S.A. for the Year ending August 31, 1945.

Ladies and Gentlemen,—It indeed gives me pleasure to present on behalf of your Committee the following items of this, the sixty-first annual report, for your information.

The membership of the Section is now the highest on record and numbers 335 members, including 10 honorary members, 7 life members, 19 corresponding members, 244 ordinary members, and 55 junior members.

During the year we have been unfortunate in losing three valued members, Dr. H. E. Dunstone and Messrs. F. C. Johnson and D. Sargent having passed on, and we extend to their relatives our deepest sympathy and regret.

We now have four clubs meeting regularly each month, and these afford members increased scope for carrying on studies in the particular branch of natural history in which they may be interested, and as their respective reports will show, membership is increasing and the interest sustained. The Zoology Club was formed during this year, and is particularly attractive to our junior members.

Evening lectures have covered a wide range of subjects and the attendance at our general meetings throughout the year has been good. We are greatly indebted to the lecturers who have helped us by speaking on such subjects as 'Natural History and Coin Design,' 'Native Camp Sites,' 'Birds,' 'Crustaceans,' 'The Aboriginals,' and 'Fungi.' The number of exhibits tabled have also tended to increase the interest of members. One evening meeting was devoted to the presentation of the Australian Natural History Medallion to Mr. J. M. Black, which was awarded for his meritorious work in Botany.

Excursions have been both numerous and varied, and have catered for every taste. Those that will not be forgotten for many days are the week-ends at the various National Fitness Hostels, the Easter camp at Punyelroo on the River Murray, and lastly, but not the least, a trip by horse team and drag to Black Hill.

Forward steps in the active participation in flora and fauna conservation was made by the establishment of a fund to promote this worthy cause and work carried out on 20 acres which have been set aside as a native flora reserve. A well-attended Arbor Day was held on this area, and 15 trees were planted to perpetuate the memory of original members of the Section.

The South Australian Naturalist was published in December and June, and the standard of our journal has received favorable comment.

A film evening held in the Shell Theatrette and the annual Conversazione in Stow Hall provided enjoyment of a lighter nature for members.

The Wild Flower and Nature Show was a success in every way, and was visited by about 1,000 people, and quite a number of new members was obtained thereby.

Our objects have also been brought before various other bodies, namely Girl Guides, Boy Scouts and Youth Clubs, by lectures on Natural History, and finally we might add that thus summarising our activities for the past year we have truly endeavoured to forward the objects of the Section.

W. M. NIELSEN,
Honorary Secretary.

THE CONCHOLOGY CLUB.

ANNUAL REPORT FOR THE YEAR ENDING JULY 31, 1945.

During the last twelve months the name of the Malacological Society was changed to the Conchology Club for the purpose of uniformity with other clubs.

A set of rules for the conduct of the Club was adopted on November 6, 1944.

Twenty-one meetings were held during the year, with an average attendance of 15 members This is the highest average attendance ever attained by Conchological enthusiasts in South Australia. The interest of all members was keenly maintained during the year under the chairmanship of Mr. George Pattison, a record number of 11 new members joined, and unity and harmony of all members prevailed.

The Conchology Club membership is the highest yet recorded, numbering now 28. Thanks of the Club are due to the Patron, Mr. B. C. Cotton, for his help and lectures on alternate meetings during the year. Seven lectures were given by members, and four

meetings held at members' residences, inspecting their collections and methods. Excursions of the Field Naturalists studying Sea Life and Conchology during the year, led by members of the Club, numbered ten. Reprints of "Recent Australian Species of the Family Rissoidae (Mollusca)," by B. C. Cotton, were purchased from the printers for members out of the funds of the Club.

This year a record book of the Club was inaugurated for the purpose of recording Conchological outings and items of interest in Mollusca and Sea Life.

D. M. PATTISON,
Hon. Secretary.

THE BOTANY CLUB.

ANNUAL REPORT FOR THE YEAR ENDING JULY 31, 1945.

The Botany Club has now a membership of 25, including one new member.

Eleven evening meetings were held, with an average attendance of seven members. The Study Circles were ably conducted by Mr. Nielsen, and members greatly appreciated his instruction: the subjects were alternatively a chosen botanical family, and some branch of systematic botany.

The eight Saturday afternoon meetings proved of great interest and pleasure. The Club is indebted to several lecturers, advanced students, also to Miss Eardley, our Chairman, Mr. Dunstone, and Mr. Wade for excellent addresses on botanical subjects. On most occasions, fresh or pressed specimens were tabled.

An hour of specimen mounting preceded each meeting, and in this way about fifteen boxes were mounted and named.

During the year the Club has had a change in the secretaryship. Miss Hansson's resignation was received with the greatest regret, as she had, with her knowledge and keen interest in botany, given excellent service to the Club since its inception in 1941.

The Botany Club has shown close interest in everything respecting native flora, and members' attention has been frequently drawn to the work of tree-planting in the National Park by Field Naturalists.

An important event during the year was the offer to the Botany Club of a large collection of wildflower specimens by Mr. Ising, of Stirling. Mr. Ising is well known to all members, as he was previously one of our best leaders, and his gift was gratefully accepted. Plans have been made for its removal to the Museum where, the Director, Mr. Hale, assures us, it will receive proper fumigation and housing space will be found for it. The Botany Club will then be responsible for the mounting and classifying of this collection.

During the past year it was thought that a change in the next year's programme should be made as regards the Saturday afternoon meetings. After some discussion at the May meeting, it was decided to hold indoor Saturday afternoon meetings only during the winter months from April to September.

In the hope that more specimen mounting would be accomplished, our Chairman suggested that members willing and free to help with this work would find the Museum Herbarium open for our use on Wednesdays from 1 o'clock onwards. Mr. Nielsen now reports that several members have availed themselves of this privilege and duty, and that already a satisfactory amount of work has been accomplished.

H. M. STOCKHAM,
Hon. Secretary.

THE GEOLOGY CLUB.

ANNUAL REPORT FOR THE YEAR ENDING JULY 31, 1945.

The Geology Club has been in existence for eighteen months, and all members will agree that in our studies we have had a happy fellowship. As Secretary, I wish to place on record the wonderful spirit of co-operation amongst our members. When disappointed in the non-appearance of our lecturers our members have risen to the occasion and shared with each other their knowledge.

We have seventeen financial members. Sometimes our attendances have not been as large as we would desire, but absences have been caused through legitimate reasons:—University studies, working back, and absence from the city. Perhaps it would be a good move to contact new members joining the Section and invite them to our meetings.

Again we place on record our deep appreciation of our University friends who have so graciously given us of their time and knowledge. We are thankful to our own

member, Mr. Edquist, who, by his attendance and willingness to help us in every way has been a tower of strength.

The General Committee kindly arranged for us to have several occasions for study in the field. These were most instructive, especially the excursion to the Glen Osmond quarries led by Mr. Standen. Members not able to be present will find an account of this excursion in the next copy of "The Naturalist."

As a Club we were invited to take our part in the Wild Flower and Nature Show last October. Our exhibits attracted much attention, and several of our members excelled themselves in giving lecturettes to interested folk.

Now that our Club has been firmly established and has proved its worth in stimulating and providing for geological studies, we look forward to making further progress in the coming year.

A. A. MARTIN, Hon. Secretary.

THE ZOOLOGY CLUB.

FIRST ANNUAL REPORT FOR THE YEAR ENDING JULY 31, 1945.

As Secretary of the Zoology Club I have pleasure in presenting the report of the Committee.

The Zoology Club was inaugurated at a meeting held in the Royal Society Rooms on February 16, 1945, and this report covers the period from that date until the present time.

The Club has been very fortunate in that Prof. Harvey-Johnston has graciously accepted our invitation to become Patron.

Throughout this session, studies in Insect Life have been given by Mr. A. G. Edquist. These have been illustrated by diagrams on the blackboard, particularly suited to the needs of our younger members. They began wth two addresses on the relation of the science Entomology to Agriculture and on Insect Structure respectively. Since then we have systematically studied the Apterygota (wingless insects), Orthoptera (cockroaches and their allies), and Isoptera (termites).

To help in these studies "The Insect Book," by W. W. Froggatt, has been used as a text book.

Talks on specimens and insect mounting and drawing have also been given.

Our membership has risen from 21 at the inaugural meeting to 34 at the present; this includes 15 junior members of the Field Naturalists' Section.

The average attendance at meetings has been 23.

J. W. McMILLAN,
Hon. Secretary.

Economic Rock Formations

By W. F. STANDEN

Being a summary of a geology outing led by the writer on June 18, 1945, at Glen Osmond.

On arrival at City Bricks Shale Quarry at 11 a.m., a talk was given dealing with the geological formation and the making of bricks.

Lava, basalt and granites were amongst the first formed rocks in the solid crust of the earth. These were in time broken down by the weathering processes into their respective constituents, namely, silica, felspar, mica, etc. In time these minerals, being composed largely of silicate of alumina, gave rise to what we term common clay, which was carried out to sea in a finely divided state, suspended in the water of rivers and creeks.

On coming in contact with sea-water, of a different density and under calm conditions, the clay settled down on the bottom, this going on season after season and through the ages of time, until great layers of plastic mud accumulated. When the weight of these deposits became too much for the underlying rocks to stand, a subsidence took place. Internal forces coupled with heat and compressed gases uplifted the whole lot above sea-level, and we see the formation now set into a hard, compact mass.

As mankind progressed step by step in the building of houses with bricks, someone suggested that this shale was once mud, why not grind it up, wet it, and mould it to the shapes we want, and by baking remake it just as hard as the original shale.

That is just what is going on at this quarry. The shale is quarried, ground up, fed into the hoppers of a mechanical brick moulding machine, and then pressed into bricks in a revolving mould under great pressure.

(*Continued on Page* 12)

THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF S.A. INC.

Statement of Receipts and Expenditure for the Year ended July 31, 1945

RECEIPTS.	£ s. d.	£ s. d.
To Bank		41 4 4
„ Subscriptions		57 1 0
„ Sales S.A. Naturalist		8 19 0
„ Wild Flower Show		61 6 3
„ Conservation Fund Donations		63 18 9
„ Life Membership Subscriptions		15 15 0
„ Coloured Plate Fund		2 11 3
„ Sundries—		
Film Evenings	3 8 6	
Sale Toolach Film	4 1 0	
Rent by Clubs	4 19 0	
		12 8 6
„ Interest General A/c		1 5 8
„ Interest Life Members' A/c		0 11 8
„ Banked in error		0 1 0
		£265 2 5

EXPENDITURE.	£ s. d.	£ s. d.
By Printing S.A. Naturalist		68 4 1
„ Printing Syllabus		8 18 2
„ Wild Flower Show		33 14 5
„ Conservation Fund Expenses		0 10 2
„ Transferred Life Members' A/c.		10 10 0
„ Transferred Coloured Plate A/c.		2 11 3
„ Postages		16 10 0
„ Sundries—		
Hire Epidiascope and Screen	1 15 6	
Rent Royal Society Rooms	5 14 0	
Rent Lecture Room	1 10 0	
Copying Film	3 0 0	
Conversazione Expenses	1 8 3	
Honorarium	15 0 0	
Wreath	0 12 6	
		29 0 3
„ Outstanding Cheque presented		0 15 0
„ Exchange on Cheque		0 0 8
„ Balance in Bank		94 8 5
		£265 2 5

We have examined the Books and Vouchers setting forth the transactions of The Field Naturalists' Section of the Royal Society of S.A. Inc., for the year ending July 31, 1945, and certify that the above account of Receipts and Expenditure is correct.

Signed—

WALTER D. REED, F.I.C.A.) Honorary
FRANK GRAY, A.I.C.A.) Auditors.

August 21, 1945.

THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF S.A. INC.

SPECIAL ACCOUNTS.

LIFE MEMBERSHIP FUND

	£	s.	d.		£	s.	d.
Balance as at 31/7/44	26	5	0	Interest Transferred to General A/c.	0	11	8
Paid into Fund	10	10	0	Balance on 31/7/45	36	15	0
Interest	0	11	8				
	£37	6	8		£37	6	8

COLOURED PLATE ACCOUNT

	£	s.	d.		£	s.	d.
Balance as at 31/7/44	8	13	0	Balance in Bank on 31/7/45	11	7	10
Transferred from General A/c.	2	11	3				
Interest	0	3	7				
	£11	7	10		£11	7	10

CONSERVATION FUND

	£	s.	d.		£	s.	d.
Donations received	63	18	9	By Purchase Trees	0	10	2
				„ Balance in Fund	63	8	7
	£63	18	9		£63	18	9

Examined and certified correct.
August 21, 1945.

WALTER D. REED, F.I.C.A.) Honorary
FRANK GRAY, A.I.C.A.) Auditors.

STATEMENT OF ASSETS AND LIABILITIES.

ASSETS.	£	s.	d.	£	s.	d.
Balance in Bank—						
General A/c.	25	14	10			
L.M. Subn.	5	5	0			
Cons. Fund	63	8	7			
				94	8	5
Life Members' Fund				36	15	0
Coloured Plates A/c.				11	7	10
Cupboards				5	0	0
Library				45	0	0
S.A. Naturalists				15	0	0
Film Toolach Wallaby				15	0	0
Flower Show Equipment				15	0	0
Amplifier				45	0	0
Outstanding Subs. estimated to realise				7	10	0
				£290	1	3

LIABILITIES.	£	s.	d.
Subscriptions in advance	2	12	6
Refund to Treasurer	0	1	0
Rent of Rooms	1	4	0
Fencing Reserve	56	0	0
Balance of Assets over Liabilities	230	3	9
	£290	1	3

Signed at Adelaide,
August 21, 1945.

W. M. NIELSON, Hon. Secretary.
W. D. WADE, Chairman.

The Green Turtle (*Chelone Midas, Linnaeus*) in South Australia

By HERBERT M. HALE, Director, South Australian Museum.

The late Mr. Edgar R. Waite in his handbook on the Reptiles and Amphibians of South Australia (Government Printer, Adelaide, January 31, 1929) states, on evidence then available, that "it is uncertain if this northern turtle does occur, or ever has occurred, in our waters." In 1932, however, confirmation of its occasional occurrence here was confirmed when Dr. J. E. Everard presented to the South Australian Museum a rib which was picked up south of Daly Head, Yorke Peninsula, South Australia; this was identified as belonging to the Green Turtle.

More recently the Green Turtle here illustrated* was found alive at Geltwood Beach, west of Millicent, in the South-East of South Australia (lat. 37° 50′ S.), by Mr. Otto Watson; the animal was actually collected on VP Day (August 15).

The Turtle was offered to the Director of the Adelaide Zoo as an exhibit, but on arrival in Adelaide it was found to be dead and so now reposes in the South Australian Museum. The carapace of this example is 18 inches in length, by 15½ inches in width, and the whole animal weighed just 23½ pounds when first received.

Although this individual must be regarded as a stray from more northerly waters, it does constitute the first record of a living specimen from the South Australian coast.

This occurrence stimulated one to make enquiries from the Directors of the Museums in Sydney, Melbourne, and Perth, regarding possible southerly records of the species, and the following information has been kindly supplied from their registers.

In the Australian Museum, Sydney, there is a small specimen of the Green Turtle which was caught in a fisherman's net at Botany Bay, New South Wales, on June 12, 1913, and also another young specimen captured in August, 1943, at a beach to the south of Wollongong in the same State (lat. 34° 22′ S.). Dr. A. B. Walkom, the Director of the Australian Museum, remembers a small specimen being caught in the surf at Manly, Sydney, about fifteen years ago.

The Director of the Western Australian Museum, Mr. L. Glauert, writes that "the Green Turtle is occasionally met with in the waters off our South-West Coast. In fact, its young are picked up on our local beaches every winter, for the creatures lay their eggs on islands of the Abrolhos Group." Mr. Glauert states further that examples have been collected as far south as Bunbury (lat. 33° 22′ S.) on the Western Coast.

Mr. R. T. M. Pescott, Director of the National Museum, Melbourne, reports that "the National Museum has no record of a Victorian specimen of the Green Turtle."

It appears, therefore, that the example of *Chelone midas* now noted represents the most southerly record of the species off Australian coasts.

The Hawksbill Turtle (*Eretmochelys imbricata*) was also included provisionally in Mr. Waite's handbook, but in this case a definite record is yet to be made.

Marine Turtles are by no means common in the seas off the South Australian coast. The species which has most often attracted the interest of fishermen and others during the last thirty years has been the Luth or Leathery Turtle (*Dermochelys coriacea*), the largest of all the turtles found in the seas to-day. In May, 1938, a specimen captured at Port Pirie and with the carapace 6 feet in length was brought to Adelaide; this example weighed 12 hundredweight. Occasional specimens of the Loggerhead (*Caretta caretta*) have been noted.

*—Cover Picture.

LIST OF BIRDS OF THE NORTHERN TERRITORY.

In the South Australian Naturalist, volume 23, number 1, March 31, 1945, page 9, column 1, after *Zonifer tricolor*, Banded Plover, take in *Charadrius mongolus*, Mongolian Sand Dotterel, which was inadvertently missed out in the original list. In the plate on page 5, Silver Crowed Friar Bird should read Silver-crowned Friar Bird. Correct also White-necked (Pacific) Heron on the same page.

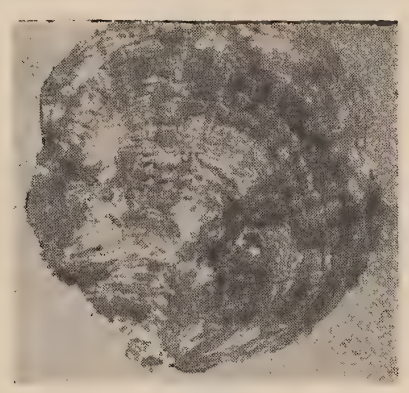
OYSTERS — FREE

By BERNARD C. COTTON.

In "The News" of May 15, 1945, appears a picture of some Port Lincoln oysters fully grown, and apparently full of gastronomic appeal. Beneath, we are informed that Mr. J. B. Anthony, a resident of Grange, "has had fresh oysters delivered almost at his door every morning since Friday." On Wednesday, May 16, "The Advertiser" tells us that Mr. Fred Skuce "picked up dozens—sufficient to provide a good feed for the company at Galway House on V.E. Day." Altogether some hundreds of dozens were reported, so that an investigation as to the source of supply, age, and quality seemed desirable.

With this object in view, a search of the beach from South Henley to Semaphore was made on June 14, when two or three dozens were obtained alive between Henley and Grange. The oysters were mature, about four years old, judged by the diameter and allowing the accepted growth of one inch per year. Numerous suggestions were made as to their origin. Some said they had been dumped by a boat, but this was ruled out, as many thousands would have to be dropped to provide a few hundred dozens on the beach, and they are still coming up. Others darkly hinted of depth charges being heard, and exploding shells, and some tales almost as amazing as that of the Loch Ness monster were volunteered, to say nothing of tidal waves and submarine disturbances.

The obvious source of supply was an oyster bed. The requirements for such a bed are principally three. Firstly, it must be a hard surface above the sand or mud, such as a reef, accumulation of old shell, clinker, shingle, pebbles, or razor fish bed, since "mud oysters" will not live in mud, where they would simply suffocate. Secondly, it must be at the right level, where there is an abundance of the microscopic life forming the food which is filtered out by the oyster, there being no mouth or jaws, teeth, or even head for that matter. Thirdly, for quick and luxuriant growth, there should be a certain amount of fresh water flowing into the area, either as seepage from the land, such as we have on many of our beaches, or the output from a creek. The effect of this is to increase the diatom content of the sea water, and so provide extra food, which has a remarkable effect on the rate of growth and ultimate size of the edible oyster. This fact was forcibly demonstrated to us when experiments on the fattening of imported "Sydney Rock" oysters were carried out in the Port River.



Port Lincoln Oysters from Henley

Through the courtesy of the State Fisheries Department, a boat was made available on July 3, and a search was made for an oyster bed. After patrolling the inshore waters, sufficient evidence in the way of razor fish heavily encrusted with oysters was found, and the location of the bed in deeper water roughly determined. Unfortunately, the recent gales had stirred up the water and rendered it cloudy, so that actual observation and tests of the bed were not possible on this occasion.

The individual oyster lays some millions of eggs each season, but only odd ones fall on suitable catchment surfaces and hatch. The tale is probably correct about the mass of shell from the offspring of one oyster, if all survived, in three years being bigger than the earth—a tale, incidentally, which has been applied to a number of animals and plants, such as certain fungi, or mushrooms, with their millions of spores. After hatching, the young oyster is free-swimming for a couple of weeks, then settles down, and remains attached to some hard surface.

There are seven well-known edible oysters found in different parts of the world. The

Port Lincoln oyster is much like the other mud oysters, such as the famous English Native, the New Zealand Stewart Island, British Columbian, Japanese, and quite distinct from the rock oysters like the smaller Sydney Rock and New York Blue Points. The Sydney Rock lives in comparatively shallow water, between tide marks, can remain alive sometimes for weeks out of water, and there is a definite male and female. The Port Lincoln lives in deeper water, does not remain alive out of water for more than a few days, and individuals may be male or female at various times.

Oysters are found in the Carboniferous Age of something like 400,000,000 years ago, but they were very numerous in the Pleistocene Age only a few millions of years ago, and beds of these are to be found in the Murray cliffs, at places like Swan Reach, and on our more recent though "dead" coastal raised beaches. Primitive man ate them, the Greeks and Romans cultivated them, and they are spoken of by Aristotle, Chaucer, Shakespeare, La Fontaine, Samuel Pepys, John Evelyn, and others. An early oyster farm was situated at the present Lake Fussard, near Rome, first used in the time of Emperor Augustus Caesar.

Some people, according to the following tales, are rather keen on oysters. Gibbon's "beastly Vitellius" ate oysters all day long, swallowing as many as a thousand at a sitting. In the reminiscences of George Pauling, the South African railway engineer, we are told: "I had a memorable breakfast at Delagoa Bay. Three of us—I refrain from mentioning the names of my companions—had a thousand oysters, with about eight bottles of champagne." The writer of "The Oyster" records the story of a man who "made a bet that he could eat twelve dozen oysters . . . while the cathedral clock of the city was striking twelve. He won his bet by placing a dozen fresh oysters in twelve wine glasses, and having swallowed the oysters, he washed down each dozen with a glass of champagne."

There are many recipes, both elaborate and simple, for the culinary preparation of oysters, but all seem very appetising. Authorities tell me that the best oyster cocktails are made with Chablis or Graves.

Reptiles with Feathers? - The Position of Archeopteryx

By H. T. CONDON, R.A.A.F., Melbourne.

Proverbially and in the scientific sense we have become accustomed to saying "a bird is known by its feathers." Recently, however, the British anatomist and ornithologist, Dr. P. R. Lowe, has published a paper containing views which if generally accepted will render all current textbooks "out of date" ('An Analysis of the Characters of *Archeopteryx* and *Archeornis*. Were They Reptiles or Birds?' *Ibis*, vol. 86, Oct. 1944, p. 517.) Dr. Lowe's researches were made on two feathered creatures generally regarded as birds whose remains were preserved in the lithographic slate of Solenhofen in Bavaria.

The first of these, *Archeopteryx lithographica*, was found in deposits of Jurassic age in 1861. It was about the size of a crow, and had teeth in both jaws, a long "palm-like" tail with twelve vertebrae, and three fingers separated from the wing and provided with claws. This fossil is now in the British Museum.

The second specimen, *Archeornis siemensi*, was discovered in 1877 and deposited in the Berlin Museum. The skull was well-preserved and also exhibited teeth. There is an extensive literature on the anatomy of both species, but it was Richard Owen in 1861 who first concluded that *Archeopteryx* was a bird. Dr. Lowe maintains that Owen was handicapped through never having seen a skull of this creature, and bases his own conclusions on a consideration of the skeletal characters of both specimens.

A German, Wagner, perhaps anticipated him in 1862, in the Annals and Magazine of Natural History (Ser. 3, vol. 9), when he referred to *Archeopteryx* as "a new fossil Reptile supposed to be furnished with feathers." There is little doubt that the structures imprinted in the slates are feathers, although, as Dr. Lowe points out, they are of a primitive kind. Close examination shows that the vanes on either side of the

central rachis are very narrow and of equal width, with weak and slender barbs. Also the individual feathers as a whole are relatively longer, narrower and more flimsy than the wing feathers of a modern flying bird of equal size. At best they are "gliding remiges."

Lowe maintains that *Archeopteryx* was an arboreal climbing and gliding dinosaur. The chief objection to this view is that it is improbable that there was a diphyletic origin of feathers. But Lowe suggests that it might be justifiably concluded that there was resident in the early generalized ancestor of birds and dinosaurian reptiles (such as the Eosuchia of the African Permian) potential genetic factors capable of evolving feathers and that these were liable to "crop up" at any time in any descendant branch. Further, he suggests that so close is the relationship between birds and certain coelurosaurian reptiles that the possession of feathers in both would hardly be a case of diphylletism; indeed, he quotes the possession of those intricate leg-structures known as the tibiotarsus and tarso-metatarsus by both birds and the bipedal dinosaurs. These do not occur in any other branch of the Vertebrates, although admirably suited for climbing, running and hopping.

Archeopteryx is shown to be nearly 100 per cent. reptilian, or more precisely, dinosaurian, and Lowe believes that it would have been impossible for it to have flown in the normal way without breaking the extremely long and slender bones of the fore-limb. The structure of the tail also indicates that it was a gliding creature. In the paper under review, Lowe considers in detail such characters as the skull, vertebrae, ribs, shoulder girdle, fore and hind limb, and feathers. Typical reptilian features of the skull are the absence of a bill and the presence of a snout, large orbit and *small brain-case*, and very short premaxillary bones (these are long and slender in birds). Again, the presence of certain bones not found in modern birds, such as abdominal ribs and caudal vertebrae and the absence of others such as the sternum indicate the reptilian nature of the two fossils.

Lowe considers that in seeking for avian ancestors, we "must banish from our minds" such gliding dinosaurs as *Archeopteryx*; they were at the "dead end of a blind alley" and represented the reptiles' final attempt to fly. They should be placed not at the bottom of the avian phylum but at the peak of the reptilian.

ECONOMIC ROCK FORMATIONS

(*Continued from Page 6*)

These bricks are then baked in a Hoffman Kiln, and the product is a very good building brick.

The Hoffman Kiln, by the way, is a continuous process kiln, having a number of compartments arranged around a central furnace, some compartments being cooked while others are being loaded or unloaded.

Leaving the kiln, the party then examined the quarry face, where many good specimens of ferruginous quartz, dendrites, and shale were procured.

After lunch a short talk was given on the old Glen Osmond silver lead mine. The silver ore being galena or lead sulphide, the ore is roasted to drive off the sulphur, leaving the silver and lead, these metals being in turn separated. Galena is associated with other minerals, namely zinc and cadmium, and sometimes gold.

The party then proceeded to a nearby quartz quarry, where a short resume of the importance of quartz in modern industry was given.

The formation was probably at one time a sea beach which has consolidated to a compact mass of quartzite rock, composed largely of the silica or sand derived from the granite after the dispersal of the clay mentioned earlier.

A short description of the crusher was given, showing how the stone was crushed and graded to various sizes by means of perforated revolving cylinders.

We then proceeded to the Unley Corporation quarry, about half a mile farther on, where the leader described the methods used by the gold prospector, that is, panning samples of dirt from a creek bed and when gold is found he examines and tests samples from all the outcrops in the vicinity for reef gold. If successful a shaft is sunk. Amalgamation and cyaniding was briefly described.

AUSTRALIAN KEYHOLE LIMPETS

By BERNARD C. COTTON.

The Fissurellidae include the Keyhole, False, Shield and Duckbill Limpets, and this interesting family can be arranged in two series, those with and those without an internal plate. Each series again displays a succession of species from those with apical "keyhole" to those with a marginal slit or undulation. The obvious abbreviations for localities, such as N.N.S.W., North New South Wales, and S.Tas., South Tasmania, etc., are used here. Some of the species mentioned here are figured inside the back cover of this publication.

FISSURELLA BRUGUIERE 1789.

The type of the genus is *Fissurella picta* Gmelin 1791 from the West Coast of America. a large species growing up to four inches in diameter, strongly concentrically undulate, with weak and numerous radial riblets, and central apical slit. Clench 1943 claims that *Fissurella* should date from Lamarck 1799 and that the genotype is *Fissurella nimbosa* Linne 1758 from the West Indies, again a fairly large shell up to two inches in diameter with central apical slit and numerous radial riblets. Clench 1943 introduces a subgenus *Balboaina*, genotype *picta* Gmelin from the Pacific coast of the Americas. A good description of *Fissurella* is given by Bruguiere Encyclopedie Methodique, Tome Second, 1830, p. 130, where he cites and describes *Fissurella picta* Lamarck as the first species and follows with the descriptions of twenty-four other species. The genus does not occur in Australia. Under this genus Hedley listed from Queensland.

Fissurella calyculata Sowerby 1823, type loc. Natal, South Africa.

Fissurella elongata Philippi 1845, type loc. West Indies.

Fissurella lanceolata Sowerby 1862, type loc. Moreton Bay, Queensland.

Fissurella minuta Lamarck 1822, type loc. Bahamas.

Fissurella octagona Reeve 1850, type loc. Philippines.

The second species is *Lucapina philippiana* Finlay 1930 of the West Indies and the Queensland shell so named may be one of the *Eligidion* species, as is also *lanceolata*. The remaining species are probably not represented in Queensland at all.

SCUTUS MONTFORT 1810.

Genotype, *Patella ambigua* Chemnitz = *Scutus antipodes* Montfort 1810. These large species are popularly known as Shield, Duck Bill Shells and Elephant Slugs, the latter name from the large black animals enclosing the shells.

Scutus antipodes Montfort 1810, N.S.W. (type), Vict.; *anatinus* Donovan 1813, S.W.A. (type), S.A. a wider species; *howensis* Iredale 1940, Lord Howe Island (type), a flattened, parallel sided, regular sculptured species with upturned posterior end.

NANNOSCUTUM IREDALE 1937.

Genotype, *Nannoscutum forsythi* Iredale 1937. Dwarf Shield Shell. Lowe Howe Island (type); a small shell with comparatively large and long animal.

AVISCUTUM IREDALE 1940.

Genotype, *Scutus olunguis* Iredale 1940. Wrinkled Shield Shells. *Aviscutum olunguis* Iredale 1940 Q. (type), N.A., N.W.A.; a range of this wavy sculptured species we have from Caloundra, Queensland, to Shark Bay, Western Australia: *parunguis* Iredale 1940, New Caledonia (type), is lower and broader with more pronounced wrinkling.

TUGALIA GRAY 1843.

Genotype, *Tugalia elegans* Gray 1843 from New Zealand. False Limpets. *Tugalia parmaphoidea* Quoy and Gaimard 1834, N.S.W. (type): *cicatricosa* Adams 1851, S.A. (type). W.A., Vict., N. Tas., differs from the former in the more depressed shell with apical scar.

HEMITOMA SWAINSON 1840.

Genotype, *Hemitoma tricostata* Swainson 1840. There is only one representative of this genus, the Rough Notched Limpet,

Hemitoma subemarginata Blainville 1819, S.A. (type), S.W.A., Vict., Tas.

EMARGINULA LAMARCK 1801.

Genotype, *Emarginula conica* Lamarck 1801, Mediterranean. This genus has been used for the Indo-Pacific species placed by Pilsbry under "Group *E. punctulata*" of *Emarginula*. *Emarginula* is applicable to the tall species with well recurved apex, inhabiting the Mediterranean Region. For the Australian and New Zealand species the following new genus is introduced. *Emarginula* has been allowed a world-wide range and there are many subgenera. No doubt considerable difference may be found between the animals of *Emarginula* and the Australasian species such as *candida*.

ENTOMELLA gen. nov.

Genotype, *Emarginula candida* Adams 1852, South Australia. Notch False Limpets. Shell ovate, conic, depressed, apex posterior, turned backwards; radial riblets alternately large and small, latticed by concentric riblets, radials denticulating the margin; fissure long and narrow, fasciole filling raised in the genotype sunken in other species. Claude M. Torr 1914 described the radula of the genotype. Radula formula $\infty.1.(4.1.4).1.\infty$. Small, bilaterally assymmetrical; median tooth of centrals broad; outermost tooth narrower than the three adjoining it, and with a flange overlapping the next inner tooth near its base; the single lateral bicuspid, blunt, and larger than the centrals; marginals, of two rows, each of twelve long fine teeth, serrated at the end, with their bases fixed to the side of the plate through two parallel rows of minute plates, and parallel to the length of the radula. Dr. Paul Fischer, Man. de Conch. fig. 604, p. 859, regards the large plate to which the marginals are joined as an extra tooth.

Distribution. Australia, New Zealand, Philippines.

Remarks. The New Zealand representatives are *Emarginula striatula* Quoy and Gaimard 1834 and the subspecies *striatula valentior* Finlay. There are also Tertiary fossils belonging to this genus in the Australasian Region such as *Emarginula transenna* Tenison Woods 1877 from Table Cape. Recent species are *Entomella candida* Adams 1852, S.A. (type), W.A., Tas., Vict.; *dilecta* Adams 1852, W.A. (type), S.A., with the filling of the fasciole depressed; *patula* Cotton 1930, S.A. (type), W.A., from 200 fathoms, with a spreading base; *subtilitexta* Verco 1908 S.A. (type), W.A., from 110 fathoms, smaller with the base not spreading; *flindersi* Cotton 1930, S.A. (type), from 130 fathoms, a minute shell; other species are *bajula* Hedley 1913, N.S.W. (type); *superba* Hedley and Petterd 1906 N.S.W. (type); *curvamen* Iredale 1925 Tas. (type), from 128 fathoms; *amitana* Iredale 1925 N.S.W. (type) from 74 fathoms; *convexa* Hedley 1907 Mast Head, Q. (type); *incisura* Adams 1852, Q.; *micans* Adams 1852, Q.; *variegata* Adams 1852, Q.; *hedleyi* Thiele 1915 N.S.W. (type), Vict., probably a deep water form of *bajula*.

MONTFORTULA IREDALE 1915.

Genotype, *Emarginula rugosa* Quoy and Gaimard. Rough Notch Limpets. The shells of this genus are distinguished from *Entomella* by the rough sculpture and very short notch. *Montfortula rugosa* Quoy and Gaimard 1834, W.A. (type), S.A.; *conoidea* Reeve 1842 N.S.W. (type), Q., Vict., is taller; *Clathrata* Adams and Reeve Q.; *cumingi* Sowerby 1863 Q.

RIMULA DEFRANCE 1827.

Genotype, *Rimula blainvilli* Defrance, a fossil. Fissure False Limpets. *Rimula exquisita* Adams 1853 Philippines (type), Q., a large oval shell with the slit closed making a hole situated half-way up the front slope.

COSMETALEPAS IREDALE 1924.

Genotype *Fissurella concatenata* Crosse and Fischer. Pitted Keyhole Limpets. *Cosmetalepas concatenatus* Crosse and Fischer 1864 S.A. (type), W.A., Vict., N.S.W., Tas. Distinguished by the peculiar sculpture like the depressions on a thimble. There are Australian Tertiary fossils of this genus.

AMBLYCHILEPAS PILSBRY 1890.

Genotype, *Fissurella trapezium* Sowerby = *javanicensis* Lamarck. Saddle Keyhole Limpets. *Amblychilepas javanicensis* Lamarck 1822, S.A., W.A., Tas. (type), N.S.W., Vict., a large, square, rayed shell; *omicron* Crosse and Fischer 1864, S.A. (type), W.A., Tas., Vict., a smaller and thinner shell.

SOPHISMALEPAS IREDALE 1924.

Genotype, *Fissurella nigrita* Sowerby 1834. Calloused Keyhole Limpets. *Sophismalepas*

nigrita Sowerby 1835, S. Tas. (type), S.A., W.A., Vict., N.S.W., oval a little longer than broad; *oblonga* Menke 1843, W.A. (type), S.A., oval, twice as long as broad; *crucis* Beddome 1882, Tas. (type); *compressa* Thiele 1930, S.W.A. (type).

AUSTROGLYPHIS COTTON AND GODFREY 1934.

Genotype, *Diodora lincolnensis* Cotton 1930. Carved Keyhole Limpets. *Austroglyphis lincolnensis* Cotton 1930, S.A. (type), W.A.; heavily frilled; *rugosa* Thiele 1930 W.A. (type), less heavily frilled.

ELIGIDION IREDALE 1924.

Genotype, *Eligidion audax* Iredale 1924. Latticed Keyhole Limpets. *Eligidion audax* Iredale 1924, N.S.W. (type); *occiduus* Cotton 1930, W.A. (type); *plicifera* Thiele 1930, W.A. (type); *ovalis* Thiele 1930, W.A. (type); *nigropunctata* Thiele 1930, W.A. (type); *jukesi* Reeve 1849, N.A. (type); *quadriradiata* Reeve 1850, Q. (type); *corbicula* Sowerby 1862, Q.; *galeata* Helbing 1779, Q.; *incii* Reeve 1850, Q., N.A. (type); *proxima* Sowerby 1862, Q.; *ruppelii* Sowerby 1835, Q.; *singaporensis* Reeve 1850, Q.; *ticaonica* Reeve 1850, Q.; some of these species may be the basis of incorrect records of *Fissurella* from the East and West Coasts of Australia. Thiele's three species are not figured and must remain something of a problem until re-examined.

FORALEPAS IREDALE 1940.

Genotype, *Macrochisma tasmaniae* Sowerby. Slot Limpets. *Foralepas tasmaniae* Sowerby 1866, Tas. (type), S.N.S.W., S.A. with fine radial sculpture; *bakeiei* Sowerby 1866, S.W.A. (type) with coarse radial sculpture.

DOLICHOSCHISMA IREDALE 1940.

Genotype, *Macrochisma producta* Adams. Narrow Slot Limpets. *Dolichoschisma producta* Adams 1850, S.A. (type), Vict., Tas., N.S.W. with normal anterior ridge and foramen; *munita* Iredale 1940, W.A. (type) with anterior ridge developing into a spout and the foramen excavating the posterior margin.

MACROCHISMA SOWERBY, 1839.

Genotype, *Fissurella "maxima"* Adams. Large Slot Limpets. In this genus, which in many ways resembles *Foralepas* and *Dolichoschisma*, the slot is half as long as the shell. *Macroschisma enopa* Iredale 1940, Lord Howe Island (type): *madreporaria* Hedley 1907, Mast Head Island, Q. (type).

ZEIDORA ADAMS 1860.

Genotype, *Zeidora calceolina* Adams 1860, Japan. Shelf Slit Limpets. *Zeidora legrandi* Tate 1894, S.A. (type); *lodderae* Tate and May 1900, N.S.W. (type), Tas., Vict., Q.; distinguished from the former by the tendency for the apex to overhang the base, instead of being within the extent of the basal periphery.

SUBZEIDORA IREDALE 1924.

Genotype, *Emarginula connectens* Thiele 1915, Kermadec Islands. Small Shelf Limpets. In this genus the internal shelf well developed in *Zeidora* is here reduced. *Subzeidora devota* Thiele 1915, N.S.W. (type).

VACERRA IREDALE 1924.

Genotype, *Puncturella demissa* Hedley 1904, New Zealand. Slot Limpets. *Vacerra menda* Iredale 1924 N.S.W. (type): *harrisoni* Beddome 1882, Tas. (type): *galerita* Hedley 1903 Q. (type): *kesteveni* Hedley 1900, N.S.W. (type).

RIMULANAX IREDALE 1924.

Puncturella corolla Verco 1908. Crown Slot Shell. *Rimulanax corolla* Verco 1908, S.A. (type), from 130 to 300 fathoms off the South East Coast of South Australia, a comparatively large thin shell with an internal shelf and retaining the apex.

RIXA IREDALE 1924.

Genotype, *Glyphis watsoni* Brazier 1894. In this genus there is an internal shelf and persistent apex and the sculpture is pronounced. *Rixa watsoni* Brazier 1894, N.S.W. (type), Vict., dredged in 50 to 70 fathoms.

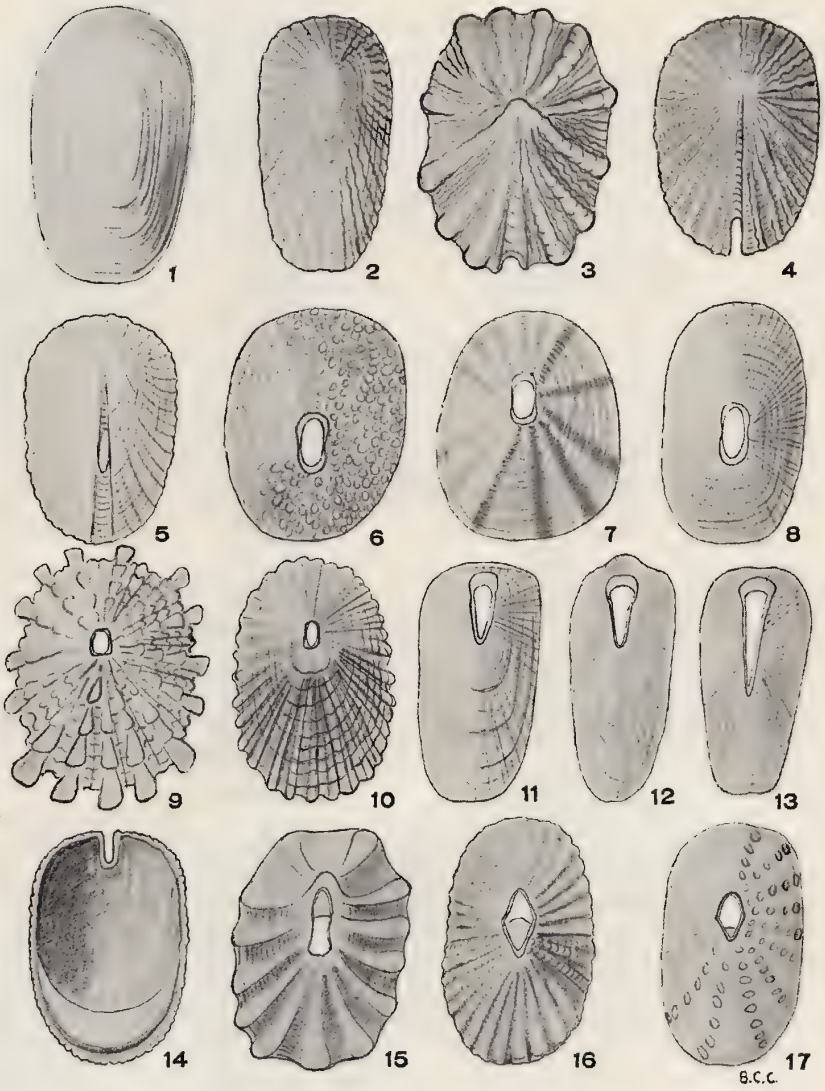
FISSURISEPTA SEGUENZA 1863.

Genotype, *Fissurisepta granulosa* Seguenza 1863, Atlantic. Slot Cap Limpets. *Fissurisepta fumarium* Hedley 1911, S.A. (type), taken in 100 fathoms off Cape Wiles, this seems to be a typical *Fissurisepta* but an examination of the animal may prove its difference or its affinity to probably *Vacerra*.

KEY TO GENERA OF FISSURELLIDAE

a No internal shelf
b Fissure marginal
c Fissure a shallow indentation
d Fissure a shallow marginal undulation
e Shell internal
f Shell large and smooth .. .. *Scutus*
ff Shell small
g Shell smooth . .. . *Nannoscutum*
gg Shell wrinkled .. .. *Aviscutum*
ee Shell external .. .. *Tugalia*
dd Fissure forming an internal groove . .. . *Hemitoma*
cc Fissure forming a distinct slit or notch
h Finely sculptured, slit rather long .. .. .. *Entomella*
hh Coarsely sculptured, notched only .. .. .. *Montfortula*
bb Fissure subcentral or submarginal
i Fissure a hole in the anterior slope .. .. .. *Rimula*
ii Fissure not a hole in the anterior slope
j Fissure subcentral, normal
k Sculpture concatenate .. .. .. *Cosmetalepas*
kk Sculpture of radials and concentrics
l Low sculpture
m Shell broad or saddle shaped, extremities not elevated . .. *Amblychilepas*
mm Shell long and oval. extremities elevated .. .. *Sophismalepas*
ll Elevated and elaborate sculpture
n Internal callus truncate posteriorly .. .. .. *Austroglyphis*
nn Internal callus not truncate posteriorly .. .. *Eligidion*
jj Fissure submarginal and long
o Slot less than half the length of the shell
p Anterior margin of shell in front of foramen not produced .. *Foralepas*
pp Anterior margin of shell in front of longer foramen produced .. .. *Dolichoschisma*
oo Slot half the length of the shell .. .. *Macrochisma*

aa With an internal shelf
q Marginal fissure
r Shelf developed . .. *Zeidora*
rr Shelf reduced.. .. *Subzeidora*
qq Central or subcentral fissure
s Fissure on dorsal slope
t Shell minute .. *Vacerra*
tt Shell medium to large .. .. *Rimulanax*
ss Fissure subcentral
u Sculpture of beaded axial ribs *Rixa*
uu Sculpture weak .. *Fissurisepta*



EXPLANATION OF PLATE

1. Scutus anatinus Donovan 1813. Robe, S.A. X 0.5
2. Tugalia cicatricosa Adams 1851. Port Lincoln, S.A. .. .. X 1
3. Hemitoma subemarginata Blainville 1819. Marino, S.A. .. .. X 1.5
4. Entomella candida Adams 1852. Marino, S.A. .. .. X 3
5. Rimula exquisita Adams 1853. Hope Island, Queensland .. .. X 4
6. Cosmetalepas concatenata Crosse & Fischer 1864. Marino, S.A. .. .. .. X 3
7. Amblychilepas javanicensis Lemarck 1822. Marino, S.A. .. .. X 1.5
8. Sophismalepas nigrita Sowerby 1835. Derwent, Tas. .. .. X 2.7
9. Austroglyphis lincolnensis Cotton 1930. Port Lincoln, S.A. .. .. X 1
10. Eligidion occiduus Cotton 1930. Shark Bay, W.A. .. .. X 1.5
11. Foralepas tasmaniae Sowerby 1866. Derwent, Tas. .. .. X 1.4
12. Dolichoschisma producta Adams 1850. Marino, S.A. .. .. X 1.4
13. Macroschisma madreporaria Hedley 1907. Mast Head Reef, Q. .. .. .. X 3
14. Zeidora legrandi Tate 1894. Corny Point, S.A. X 3
15. Vacerra harrisoni Beddome 1882. Brown's River, Tas. .. .. X 10
16. Rixa watsoni Brazier 1894. Port Jackson, N.S.W. .. .. X 7
17. Fissurisepta fumarium Hedley 1911. Cape Wiles, S.A., 100 fms. .. .. X 15

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Beaded Top shells
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The South Australian

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THESE PLATES ILLUSTRATE R. SPRIGG'S PAPER ON THE MT. PAINTER DISTRICT

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URANIUM DEPOSITS AT MOUNT PAINTER

By REG. C. SPRIGG.

It is a generally accepted fact that the world has changed more rapidly in the last two centuries than in the preceding two thousand years. This change, which all of us may not be willing to call Progress, was due in large measure to the harnessing of new forms of energy, namely, those generated from coal and petroleum.

To-day, however, we are experiencing an industrial revolution far more stupendous than that which began with James Watt and his kettle. The utilisation of energy released from the "splitting" of the atom opens up a completely new epoch in human history.

For many years we have been diverted by the writings of H. G. Wells, H. Nicholson, and others who foretold the harnessing of atomic energy, but not even the most far-seeing of us took their prophecies over seriously. The last twelve months has served to pull us up with a jolt. What was only recently regarded as fantastic has now become possible and inevitable. Man in this new conquest of his environment enters a period i which possibilities of human advancement exist side by side with the gravest and most terrible threats to all civilisation.

Until September of this year when the first public announcement was made, in the form of the atomic bomb, of the degree to which atomic research had progressed the general public, in spite of whispers of "things to come," regarded their economy as basically a coal and petroleum one. We now learn that the next ten years may render these two sources of power virtually obsolete. At first it was believed that the comparative rareness of the uranium isotope (U.235) used in the earlier successful work on the production of atomic energy, would prohibit its large-scale use. Such beliefs have been shattered by the announcement that other completely new elements (plutonium, neptunium and probably another) have been made from ordinary uranium, which is relatively plentiful. There seems no end to the possibilities of the new complex and unstable elements which can be "manufactured" by the cyclotron or atom smasher. Obviously then, uranium, a hitherto relatively unimportant element, will become the world's most sought after mineral. South Australia has the unique fortune of being the only State in the Commonwealth to possess uranium deposits. The chief occurrences are located at Mount Painter in the Flinders Ranges and at Radium Hill near Olary. They have been intensively surveyed in the past two years.

THE HISTORY OF THE MOUNT PAINTER FIELD.

The original discovery of uranium minerals in the vicinity of Mount Painter was made in 1910 by Mr. W. B. Greenwood. Greenwood, unlike most prospectors who are attracted first and foremost by the lure of gold and copper, sought the more unusual minerals. Obviously a keen naturalist, he spent many years of his life in the inhospitable granite country centred about Mount Painter. The region presented disheartening problems for even the most hardened prospector. Waterholes were few and far between and the rugged topography presented a formidable barrier, but somehow the country appealed to Greenwood as inevitably such country must to the adventurous. He was employed and subsidised periodically by the South Australian Government as a prospector for the district. The yellow and green minerals which he found on an outcrop on Radium Ridge were identified as uranium minerals by the Department of Mines and Sir Douglas Mawson.

Interest in the find was very quickly aroused and three companies were formed to explore the field. The object was to secure radium, a by-product of uranium disintegration. In the first twelve months seven "shows" were opened up, but only a few tons of ore were raised. The No. 6 deposit proved to be most highly mineralised, and some beautiful specimen ore was recovered from these workings. These found their way into museums all over the world.

(See pictures inside covers)

LOCALITY MAP SHOWING IMPORTANT OCCURRENCE OF URANIUM ORES AT RADIUM HILL AND MT. PAINTER

The uranium minerals—autunite (yellow hydrated calcium uranium phosphate) and torbernite (green hydrated copper uranium phosphate)—are very spectacular in appearance and won great favour as exhibits.

Unfortunately, after starting very well, the main shoot in No. 6 Workings cut out very abruptly and since that time no comparable shoots have been located.

In the years which followed, the radium companies experienced great hardships and financial loss. By 1917 the field was deserted and remained so for a number of years. Then in 1924 a keener market for radium led to renewed interest in the deposits and four companies, financed in Victoria and South Australia, were formed. However, this new activity was also doomed to failure. Low grade ore, the lack of permanent waters and the extreme cost of transport killed the venture. Many 'lodes' had been proved to carry uranium, but none of sufficient grade to cover the exorbitant expenses incurred in development. All activity at the field ceased once more in 1934, the total value of radium ore produced at the field being estimated at £10,000.

THE 1944-5 INVESTIGATIONS.

In May, 1944, the British Government approached the Commonwealth Government requesting immediate investigations into the uranium resources of Australia. The Commonwealth communicated with the South Australian Government and in a very short period the relevant geological departments were planning a large and ambitious mineral search to be made with the shortest possible delay. The project was to be undertaken without regard to economic considerations, the urgency of the situation rendering them relatively unimportant. The reason for the survey was kept a close secret, but the venture came to be known as the Mount Painter Project. The establishment of camps in the inhospitable terrain about Mount Painter and the procuring of personnel proceeded with a minimum of delay.

Following an inspection of the old workings by the South Australian Director of Mines, plans were formulated for a thorough examination of the Mount Painter Field by a team of experts and later for the testing of more favorable deposits by a group of competent miners and mining engineers. Plans submitted to London covered the following tasks:

1. Construction of serviceable roads into a hitherto trackless, rugged terrain.
2. The establishment of camps, the setting up of mining machinery and the exploration of the most promising deposits.
3. If warranted the erection of a mill to treat 100 tons of ore per day, and to further develop the mines.

All this was to be done at an estimated cost of slightly less than £100,000. The third stage mentioned was never realised, with the result that the total expenditure was much less than the full estimated cost. It was realised from the outset that the record of previous mining operations within the area indicated that chances of worthwhile success were slight.

However, as we can all see now, there was very good reason for investigating even the poorest uranium deposits. Allied Intelligence had shown that the enemy was well advanced in the vital race to tap atomic energy, and the United Nations, therefore, had not a moment to lose in assessing all matters appertaining to uranium as the war's super secret weapon.

In the closer examination of the Mount Painter Field which began late in June, 1944, many governmental and military bodies co-operated in close secrecy and with the greatest of speed. Miners were flown in to the field from all parts of the Pacific war zone.

THE SURVEY.

In the early days of the Project it was evident that quick geological surveys were needed to formulate a programme of mining development in readiness for the day of completion of the roads into the area and with the consequent arrival of heavy mining machinery.

The first geological camp established near Mount Painter received its supplies by camel from the "road" head near Arkaroola Station. All water had to be carted to the camp, in addition to food and other essentials. The original camps were rough, but later when the Mount Painter road was com-

pleted galvanised-iron huts and mess rooms were erected and a refrigerator installed.

Geological examinations were made on all known occurrences of uranium minerals, and at a later stage a geological survey was carried out over an area of 140 square miles of rugged mountainous country in an attempt to limit the potentially uraniferous area. This object was realised satisfactorily, and in the course of operations several new uranium deposits were found.

In the East Painter area many small "finds" and one more important deposit which tends to rival the famous No. 6 Workings to the west were located. Unfortunately the programme of investigation was curtailed before this deposit could be well tested.

To carry out the survey for uranium minerals with the most modern means available, geophysical experts from Canberra perfected a portable Geiger-Muller apparatus for use in the field. This measures the intensity of gamma rays (amongst other things) given off by disintegrating uranium, and, therefore, provides a means of locating areas with high radio-activity which can be tested further for uranium mineralisation. Unfortunately a number of complications are associated with the use of such instruments in the Mount Painter Field, and so the results obtained were not quite as good as was anticipated.

In the reconnaissance geological survey over the large reserved area, the conditions experienced by earlier prospectors were relived for a period of two or three months. Long treks over almost waterless rugged country traversed by deep gorges more than a thousand feet deep provided many discomforts, especially in hot weather. However, the experience was unique, and none of the geologists on the survey would have missed the opportunities of really getting to know this inhospitable but fascinating country.

GEOLOGICAL SETTING.

The northern Flinders Ranges is largely an area of ancient sedimentary rocks which were laid down in a vast depression, probably occupied for the most part by a great lake, although at intervals the sea undoubtedly entered the depression. Climate during this period of deposition varied from frigid to arid. A tremendous volume of rock debris was carried into the basin by icebergs and dumped, later to become tillite, which is typically a fine-grained rock "flour" in which large boulders, usually scratched, faceted and angular, are set irregularly. Later the climate became mild, and then warm and arid. About Mount Painter volcanoes were active during the period of deposition of the sediments, but the greatest activity by volcanic agencies occurred later.

Towards the end of this deposition period, which occurred between 400 and 600 million years ago, great stresses had accumulated within the earth's crust in the vicinity of the depression, due largely to the accumulation there of thousands of cubic miles of sediment, weighing many trillions of tons With this instability great pressure forced the strata into great folds, and in the Mount Painter area granite was forced in from below. The extreme temperatures from the invading igneous magma altered many of the sedimentary rocks and formed new minerals.

It is with this granite that radio-active minerals are associated. The uranium was concentrated during a later stage in the cooling of the granite in the form of a mineral called fergusonite, and possibly also as pitchblende, although the latter mineral has not yet been found in the region.

Later than this there was another period of volcanic activity, and then the area became stable, and except for great inroads by erosion little appears to have happened to the rocks for several hundred million years.

A member of the Adelaide University Staff has recently analysed the fergusonite, and by measuring the ratio of uranium to lead present has found that it is about 440 million years since the mineral crystallised in the granite. This agrees with other geological evidence found during the Survey.

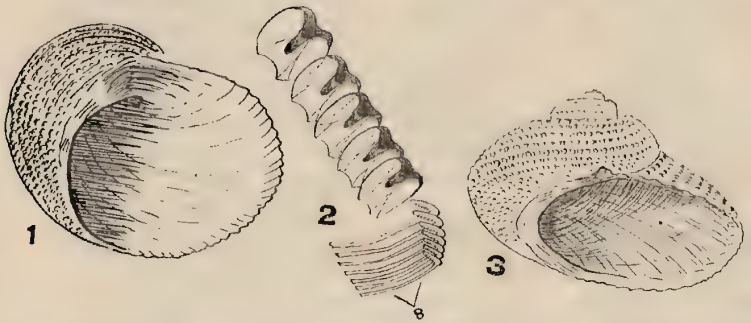
The most promising uranium prospects in the area have a more complex history than that outlined for fergusonite. They are secondary deposits which have formed from the original or primary deposits by the action of circulating waters. The uranium at some relatively recent time was apparently dissolved from great zones of crushing in the granite and redeposited in crevices near the land surface. Unfortunately through deep

(Continued on Page 9)

AUSTRALIAN BEADED TOP SHELLS

By BERNARD C. COTTON.

The Beaded Top Shells belonging to the family Stomatellidae are distinguished by the prickly, granulate and sometimes coarsely fenestrate sculpture developed on spiral ribs. The whorls are few, rapidly enlarging to a big body whorl and round aperture. The aperture may be very large, as in the typical Beaded Wide Mouth, *Stomatella imbricata*, or reaching its smallest expression in the peculiar Beaded Window Shell, *Herpetopoma fenestrata*. The outer lip is thickened and crenulate within, the operculum corneous, paucispiral or multispiral, rapidly increasing. The animal resembles that of the Trochidae, an affinity which is also supported by the radula features. The species are dispersed through the Indo-Pacific, Southern Australia and New Zealand. In South Australia these molluscs are quite common, crawling on the underside of reef boulders just below low tide mark at such places as Marino. The localities are abbreviated, S.W.A.=South Western Australia, etc. The key to genera will help the student in diagnosis. This family is quite distinct from Stomatiidae containing the true Wide Mouth *Stomatia* and False Ear Shells *Gena* and similar genera.



Figs. 1 and 3.—*Stomatella imbricata* Lamarck, shell, x 1.25, Marino, S.A.
Fig. 2.—*Stomatella imbricata* Lamarck, radula teeth.

STOMATELLA LAMARCK 1819

Genotype, *Stomatella imbricata* Lamarck. "Java" error. Beaded Wide Mouth, *Stomatella imbricata* Lamarck 1816, figs. 1—3, S.W.A. (type), S.A., Vic., N.S.W., Tas.

EUCHELUS PHILIPPI 1847.

Genotype, *Turbo atratus* Gmelin. Tropical. In this genus the shell is typically large and umbilicate. The Black Beaded Top Shell. *Euchelus atratus* Gmelin 1791, Philippines. N.A., Qld.; *rubrus* Adams 1853, China, Qld., N.A. The Red Bead Shell.

TALLORBIS G. & H. NEVILL 1869

Genotype *Tallorbis roseola* G. & H. Nevill. Rose Dotted Bead Shell *Tallorbis roseola* G. & H. Nevill 1869, Ceylon (type), Qld., N.A., Duke of York Group, Ulu Island.

VACEUCHELUS IREDALE 1929

Genotype, *Euchelus angulatus* Pease 1867. Polynesia. Toothless Bead Shells. *Vaceuchelus ampullus* Tate 1893, N.W.A. (type), S.W.A., W.Vic., N.W. Tas., Qld., N.S.W.; *profundior* May 1915, Tas. (type) 100 fms., S.A., S.W.A., W.Vic.

HERPETOPOMA PILSBRY 1890.

Genotype, *Euchelus scabriusculus* Adams and Angas. Beaded Top Shells. In the genus the shell is imperforate or typically minutely umbilicate. *Herpetopoma scabriuscula* Adams and Angas 1867, fig. 4, N.S.W. (type), Vic., S.A., Tas.; *vixumbilicata* Tate 1893, fig 5, S.A. (type), W.A., a broader shell with well developed sculpture. Both these species are typical examples of the genus, both being consistently minutely umbilicate. The next

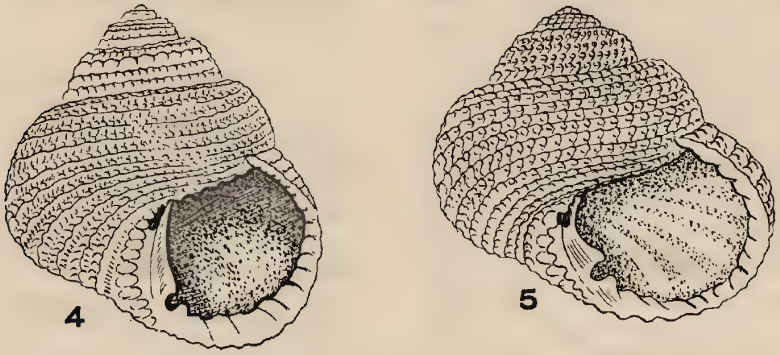


Fig. 4.—*Herpetopoma scabriusculus* Adams & Angas, x 10, Robe, S.A.
Fig. 5.—*Herpetopoma vixumbilicatus* Tate, x 10, Marino, S.A.

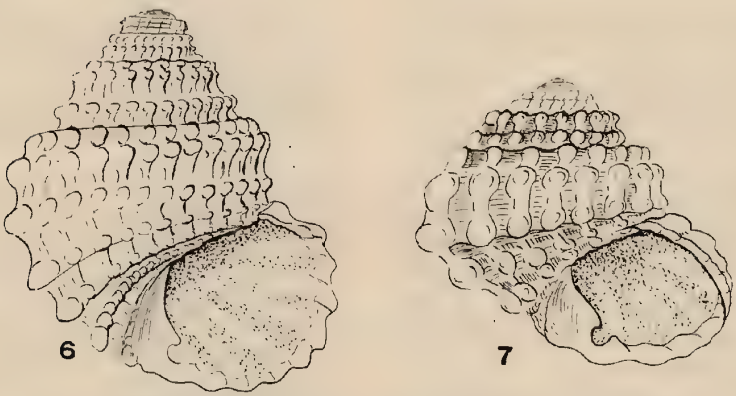


Fig. 6.—*Herpetopoma fenestrata* Tate, x 15, Reevesby Island, S.A.
Fig. 7.—*Herpetopoma pumilio* Tate, x 15, Fowler Bay, S.A.

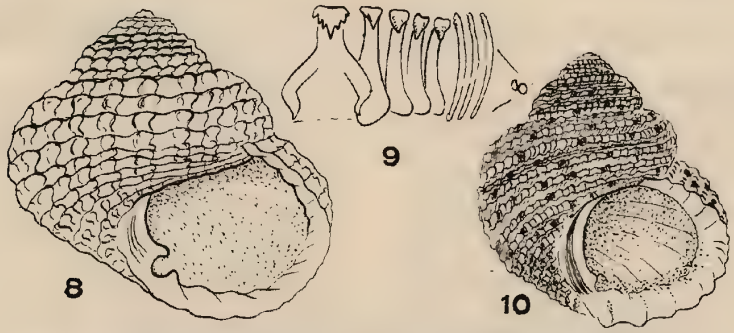


Fig. 8.—*Herpetopoma annectans* Tate, x 10, Reevesby Island, S.A.
Fig. 9.—*Herpetopoma aspersus* Philippi, radula.
Fig. 10.—*Herpetopoma aspersus* Philippi, shell, x 3, Marino, S.A.

three differ from the type in the coarser fenestrate sculpture and imperforate shell; *Herpetopoma fenestrata* Tate 1893, fig. 6. W.A. (type), S.A.; *pumilio* Tate 1893, fig. 7, S.A. (type), W.A.; *annectans* Tate 1893, fig. 8, W.A. (type), S.A., this has not been figured before. The Fine Beaded Top Shell, *Herpetopoma aspersa* Philippi 1846, figs. 9, 10, W.A. (type), S.A., Vic., Tas., N.S.W. again differs from the type in being large, finely sculptured and imperforate, but all have a basal tooth on the columella. These differences are expressed in the form of a key.

DANILIA BRUSINA 1865.

Genotype, *Monodonta tinei* Calcara, Mediterranean. *Danilia telebatha* Hedley 1911, S.A. (type) 100 fms., Tas. 80 fms. The Thick Lip Bead Shell.

BASILISSA WATSON 1879.

Genotype, *Basilissa lampra* Watson 1875, Mid-Pacific, East of Japan, 2,050 fms. Slit Top Shells. *Basilissa bombax* Cotton and Godfrey 1938. S.A. (type) 130 fms., also 300 fms.; *bilex* Hedley 1905, N.S.W. (type); *superba* Watson 1879, Qld., East of Cape York 1,400 fms. (type).

SEQUENZIA JEFFERYS 1876.

Genotype, *Sequenzia monocingulata* Sequenza, West Indies. Glossy Slit Top. *Sequenzia polita* Verco 1906, S.A. (type) 300 fms.

KEY TO GENERA OF STOMATELLIDAE

a. Shell ear-shaped .. .. *Stomatella*
aa. Shell turbinate.
b. No sinus in the outer lip.
c. Outer lip not varied.
d. No tooth at base of columella.
e. Columella truncate and three plicate anteriorly .. .. *Tallorbis*
ee. Columella not truncate or plicate .. .. *Vaceuchelus*
dd. Tooth at base of columella.
f. Imperforate or very narrowly umbilicate .. .. *Herpetopoma*
ff. Umbilicate .. .. *Euchelus*
cc. Outer lip varied .. .. *Danilia*
bb. Sinus in outer lip.
g. Sinus wide and shallow .. .. *Basilissa*
gg. Sinus deep .. .. *Sequenzia*

KEY TO SPECIES OF HERPETOPOMA.

a. Shell minutely umbilicate.
b. Whorls flatly convex, shell rather high .. .. *scabriuscula*
bb. Whorls convex, shell wider .. .. *vixumbilicata*
aa. Shell imperforate .
c. Spire elevated .. .. *fenestrata*
cc. Spire normal.
d. Shell small, under 5 mm. spiral lirae comparatively few.
e. Two stout lirae on the penultimate whorl .. .. *pumilio*
ee. Five lirae on the penultimate whorl .. .. *annectans*
dd. Shell large, about 15 mm. in length, spirial lirae fine and numerous .. *aspersa*

PREVIEW OF A POPULAR ACCOUNT OF SOUTH AUSTRALIAN SHELLS

South Australian naturalists need no introduction to Mr. B. C. Cotton and his important contributions to our conchological literature. A new publication, South Australian Shells, by this author is designed for the beginner in conchology and as a preliminary to higher study such as is provided by the Science Guild Handbook.

The introduction gives that information which all beginners desire to know, viz., where to find, how to clean and preserve, and how to store the shells which they collect. The book itself contains descriptions of all the shells likely to be found during the early days of collecting on local beaches, as well as those shells which are especially important because of their rarity or conchological interest. About 120 species are described and information of interest is included together with both common and scientic names. All the species listed are ably illustrated in halftone by Miss Gwen Walsh.

There is but one criticism—the attempt to employ common names for all species whether they are, or are not, currently in use by conchologists and laymen. Mr. Cotton, with his familiarity with amateur collectors, has no doubt considered this advisable.

The whole set-up of the booklet, which will soon be available from the S.A. Museum at a price of one shilling, is highly commendable to all those interested in S.A. natural history.

W. G. BUICK.

URANIUM DEPOSITS AT MT. PAINTER

(Continued from Page 5)

erosion by streams much of these concentrations of uranium minerals have been eroded away. Those which remain are apparently merely the roots of former valuable deposits. deposits.

If this general theory is the correct one. then the future of the secondary uranium deposits about Mount Painter is not bright. However, the great strategic value of uranium and its probable use for the production of energy for industry render any deposits, even though small, very significant. The search for new deposits and the more complete testing of the known ones will be prosecuted with increased vigor in the near future.

COVER PICTURE.

WINDOW PANE AND SADDLE OYSTER.

The Saddle Oyster, *Ephippium ephippium* Retzius 1788, is a delicate thin shell about six inches in diameter when fully grown, and lives loose on the coral reefs of Tropical Australia. The two valves of the shell fit so closely that one wonders where there is room for the animal, which must be very thin. The interior is lined with mother-of-pearl and the colouration is something like tortoise-shell. The hinge has two raised rib-like teeth in the form of an inverted V in the upper valve and there are two corresponding sockets in the lower valve. The Saddle Oyster belongs to the family Placunidae and is the only species of the genus *Ephippium*.

The Window Pane Oyster belongs to the same family, but to the genus *Placuna*, of which there are four species. The common Window Pane, *Placuna placenta* Linne 1758, is common on the beaches of North Queensland, where it lives buried just below the surface of the sand. The shell is round, flat, thin, and looks like a piece of frosted glass. The space in which the animal lives between the valves is even less than in the Saddle Oyster. Both species have the shell flat in the juvenile, though it is saddle shaped in the adult of *Ephippium*, and both have a similar type of hinge. Neither the Saddle Oyster nor the Window Pane belong to the true Oysters.

B. C. COTTON.

NOTICE

If financial members do not receive their copy of "The Naturalist" will they please communicate with the Hon. Magazine Secretary, Mr. A. K. Beasley, Harris Street, Marden, Adelaide. Telephone F 1984.

NOTES ON SOME SOUTH AUSTRALIAN BATS—No. 2*

By E. F. BOEHM.

RED FRUIT-BAT (*Pteropus scapulatus* Peters 1862):

Prof. F. Wood Jones ("Mammals of South Australia," III: 385; 1925) mentions that several stragglers of "Flying Foxes" have been reported in South Australia, but he does not give any details concerning species and localities. The only specimen of a *Pteropus* from this State known to have been examined by a naturalist was found about 100 miles east of Leigh's Creek, and was exhibited at a meeting of the Royal Society of South Australia on August 5, 1902, by the late A. H. C. Zeitz. Although the species does not appear to have been determined, it was most likely the Red Fruit-Bat, of which stragglers have been reported from on the Darling River, N.S.W., and Longreach, Q. However, its occurrence in South Australia needs confirmation.

ORANGE HORSESHOE BAT (*Rhinonicteris aurantius* Gray 1845):

The inclusion of this Northern Australian species in the fauna of the State by Wood Jones (ibid., 446-49) without adequate confirmatory evidence raises the question whether this course can be justified. F. G. Waterhouse, in William Harcus' book "South Australia: Its History, Resources, and Productions," p. 283; 1876, lists it for the "Northern tropical portion of the Colony." One doubts the alleged occurrence of what seems to be an essentially tropical form in the arid interior, where E. J. Eyre is said to have seen it.

GEOFFROY'S LONG-EARED BAT (*Nyctophilus geoffroyi* Leach 1821):

Two races of this Long-eared Bat are found in South Australia, and their ranges meet somewhere about the southern extremities of the Flinders Ranges. *N. geoffroyi pallescens* Thomas 1913, which inhabits the arid and desert regions in the north of the State, is both smaller and paler than the form which occupies the moister country to the south. It is an interesting example of the effect of humidity and temperature on a sedentary species of Bat.

BALSTON'S BROAD-NOSED BAT (*Scoteinus balstoni* Thomas 1906):

In my previous note ("S.A. Naturalist, 21: 4; 1941) on a specimen from the South-East of the State read "Radius 35 mm." instead of "Expanse 35 mm." in col. 2, line 9.

BENT-WINGED BAT (*Miniopterus blepotis* Temminck 1840):

Some of the caves in scrub-covered ranges in the Hd. of Joanna, near Naracoorte, South-East South Australia, are inhabited by great numbers of Bent-winged Bats. The animals cling in clusters to the rock in dark holes in the roof of the caves, where they spend the day. A series of specimens obtained by Mr. J. B. Hood in 1932-34 were the very dark form described by Wood Jones (loc. cit. pp.431-33). As in the case of Geoffroy's Long-eared Bat, the form inhabiting the interior of the continent is much paler in colour. Wood Jones calls the species "Schreiber's Long-tailed Bat (*Miniopterus schreibersi* Natterer 1819)," which latter species, however, would seem to be purely extra-limital in its distribution. The countless thousands of bats once observed by Dr. Charles Fenner ("Mostly Australian," p. 78; Melb. 1945) emerging one evening from a cave near Naracoorte were probably *M. blepotis*. It may be of interest to mention here that a minor limiting factor in bat populations is the predations of certain kinds of birds which attack and kill the animals when they appear too early in the evening or stay out too late in the morning, or are disturbed by man and forced to fly during broad daylight. In South Australia the Little Falcon (*Falco longipennis*), White-backed Magpie (*Gymnorhina hypoleuca*), and Grey Butcher-Bird (*Cracticus torquatus*) are known to have killed small bats on rare occasions. A. H. Chisholm ("Bird Wonders of Australia," p. 103; 1934) records seeing

* The first contribution in this series appeared in "S.A. Naturalist," 21: 15: 1942.

what must be an exceptional case of a Wedge-tailed Eagle (*Uroaetus audax*) killing a small bat in an undisclosed Australian locality.

WRINKLE-LIPPED BAT (*Chaerephon colonicus* Thomas 1906):

As Wood Jones (loc. cit. pp. 397-99) does not give adequate confirmatory evidence for the inclusion of the Wrinkle-lipped Bat in the Microchiropteran fauna of the State, some doubt remains regarding its occurrence so far south. Old specimens, if labelled "South Australia," possibly came from what was known in the early days as the Northern Territory of South Australia, situated beyond the northern boundary of our State. In the Gulf Country, Queensland, the species is exceedingly numerous, for Albert De Lestang ("Australian Zoologist," 6: pp. 106-107) states that "thousands" were once flushed by him when a large hollow tree was felled at Adel's Cove, Bourketown.

Discovery of the Toolach, or Grey's Wallaby (Wallabia Greyi) (J. E. Gray, 1843; Waterhouse, 1846)

By H. M. WHITTELL, O.B.E. AND J. D. SOMERVILLE.

No locality in South Australia was designated when this species was first named and later described; specimens sent to England by Captain (later Sir) George Grey constituted the type-specimens when the animal was first named by J. E. Gray as *Halmaturus Greyi*, in *List of Specimens of Mammals in the British Museum*, page 90, published on May 13, 1843. Gray merely gave a name to the species and added no description, so it was a *nomen nudum*, and the scientific naming of the species dates from 1846, when Waterhouse's *Natural History of Mammals* was published wherein Waterhouse, I. page 122, in adopting the name previously given by Gray, but under the genus Macropus, gave also a satisfactory description.

It is from a record in G. French Angas's *Savage Life and Scenes in Australia and New Zealand . . . London*, 1847, that the type-locality has been determined as 'the Coorong.' On Page 41, Vol. I, Angas wrote 'Soon after my arrival in Adelaide [January 1, 1844], I started for the Lake Country'; and on page 70 [a party which included Angas was examining the country around Lakes Alexandrina and Albert] 'we proceeded from the Coorong across the extremity of the limestone country covered with scrub, known as the Desert, towards Bonney's waterholes. From these limestone hills, the entire surface of Lake Albert is seen, forming a landscape peculiarly Australian. Numbers of brush-kangaroo (*Halmaturus greyii*) were put up constantly, and though our dogs took after them, these elegant little kangaroos always outstripped them from their extreme swiftness. This new and beautiful species, named after his Excellency Captain Grey, who procured the first specimen, is remarkably local in its distribution, being exclusively confined to the desert-scrub bordering on Lake Albert and the north-west end of the Coorong.'

Subsequent investigations revealed that its habitat was much more extensive than stated by Angas.

But when did Grey collect the type-specimens?

In April and May, 1842, Grey was 'shooting along the Coorong' with Deputy Surveyor-General Thomas Burr; it is not known how far they went, but at least as far as Latitude 36—say Salt Creek. See *Account of Governor G. Grey's Exploratory Journey Along the South-Eastern Sea-board of South Australia.* By Mr. Thos. Burr, Dep. Surv.-Gen. *Journal Royal Geographical Society of London* 15, 1845: 160-184. There is no other record of the 1842 trip beyond Burr's reference to it on pages 165 and 181, but it must have been on that occasion that Grey collected the two animals which became the type-specimens of the species. According to F. Wood Jones (*Mammals of South Australia*, 2, 1924: 244), "the Toolach has always been confined to the south-eastern portion of South Australia . . . and many people can remember the time when Toolaches swarmed in the neighbourhood of Kingston."

When did Grey send the type-specimens to England?

On August 13, 1842, Grey wrote (see *Emu*, 38, 1938: 217-226) from Adelaide to John Gould that he had sent by the ship *King Henry*, via Launceston, a box containing 42 specimens of natural history (34 being birds) to the Trustees of the British Museum. Were the type-specimens of the Toolach among the eight other specimens? On October 31, 1842, Grey wrote again to Gould, this time specifying that he had three or four new kangaroos of which he would send him specimens, such specimens to be handed over to the British Museum when Gould had 'used them'—presumably 'described and named them.' Owing to shipping difficulties the consignment of specimens, which appears to have been large—five cases[1]—did not leave Adelaide until the *Sultana* and the *Taglioni* cleared for London 9th and 25th January, 1843, respectively. The consignment contained at least 19 skins of kangaroos, several of which Grey believed to be new. Grey asked Gould to 'name and describe any that you may find which have hitherto been unnoticed.' (*Emu*, 38, 220.) The assumption is that the two skins and skulls of the wallaby to be named as *Halmaturus greyi* were among those sent by the *Sultana* and *Taglioni*, but we shall probably never know how it came about that Gould himself was not the first to name and describe them. Gould may have been preparing to name and describe them when J. E. Gray's *List of Specimens of Mammals in the British Museum* anticipated him when it appeared on May 13, 1843—a month or so after the arrival of Grey's skins in England.

The above records were, however, not the earliest dates on which the Toolach was noticed, for the following interesting particulars quoted by Gould in his *Mammals of Australia*, 2, plate 19, [1845 to] 1863, from Frederick Strange, must have been gathered in 1839-40. "Mr. Strange informs me that he met with this animal 'between Lake Albert and the Glenelg (River?). The kind of country in which it is found consists of large open plains intersected by extensive salt lagoons and bordered by pine ridges. On fine sunny days it is to be found in the salt-water scrub around the lagoons and amid the long grass of the plains. I never saw anything so swift of foot as is this species: it does not appear to hurry itself until the dogs have got pretty close, when it bounds away like an antelope, with first a short jump and then a long one,[2] leaving the dogs far behind it. In wet weather it confines itself to the sandhills. I have had twenty runs in a day with four swift dogs and not succeeded in getting one.' " Strange was one of the earliest, if not actually the earliest, collectors of specimens of natural history in South Australia—an account of the collecting he did in the Colony is in course of preparation. He appears to have been employed with survey parties at or near Lakes Alexandrina and Albert during portions of the years 1839 and 1840, but removed from South Australia to New South Wales probably during the latter year, some little time prior to the arrival of Governor Grey.

Did Strange collect and submit specimens to Gould with the above particulars prior to leaving South Australia (he visited England in 1852 and was sure to have come in contact with Gould whom he had already met in South Australia in 1839), or did he give the particulars to Gould when on the visit to England?

Up to the present no answer has been found to these questions. (See Addendum.)

Strange refers to Lake Albert by name in connection with the Toolach, but it is interesting to note that Lake Albert was not so named until Governor Gawler made a visit to the Murray Mouth in August-September, 1840.

However, although Governor Captain George Grey did not arrive in South Australia until May, 1841, specimens sent by him constitute the type-specimens when the Toolach was first named by J. E. Gray in 1843, and they were probably collected when the Governor and the Deputy Surveyor-General were in the neighbourhood of the Coorong in April and May, 1842.

1—The manifest of the *Taglioni* shews that 4 cases were consigned by His Excellency Governor Grey to G. (sic) Gould. It is interesting to notice that by the same boat there were 19 other cases consigned by different consignors. (S.A. Archives 768.)

2—F. Wood Jones, *Mammals of South Australia*: 245, says two short hops and one long one.

Since the text was written and in print some further particulars regarding Gould's work have been ascertained.

As is generally known, Gould's *Mammals of Australia* was issued in parts between 1845 and 1863. When completed the plates were rearranged into generic order and bound into three volumes, with the date of 1863 shewn on the title, which gives no criterion as to when any particular plate was originally issued.

By courtesy of Messrs. Troughton, of the Australian Museum, Sydney, and White, of the Parliamentary Library, Canberra, attention was drawn to the little known but valuable book by F. H. Waterhouse. *The Dates of Publication of Some Zoological Work of the late John Gould, 1885*, which lists all the major works of Gould except *Birds of New Guinea*. Therein it is shewn that *Macropus (Halmaturus) greyi* appeared in part VI, the issue date being 1852.

Frederick Strange arrived in England in June, 1852, but up to the present it has not been ascertained whether part VI was issued prior to, or after, his arrival.

The following particulars of some of Gould's books may be of interest to field naturalists.

Mammals of Australia.—There are apparently no copies in Australia of the individual parts. In the bound volume I there are two lists of plates. The first list (pp. iii—vi) should be disregarded, the correct list being that shewn on pp. xxiii—xxxix. Reference to F. H. Waterhouse's book quoted above will shew the part number and the year of issue for any particular plate.

Birds of Australia.—There are apparently no copies in Australia of the individual parts. The plates were rearranged in generic order when binding into seven volumes. Reference to Waterhouse's book quoted above is necessary to ascertain the part number and the year of issue for any particular plate.

Birds of New Guinea.—The completion of this work was subsequent to the issue of Waterhouse's book quoted above. Like all of Gould's major works, it was issued in parts and subsequently bound into volumes. Strangely, two systems for arranging plates were adopted. In one the plates were left in the same order as originally issued in parts, and in the other the plates were rearranged into generic sequence.

The Mitchell Library and/or the Public Library, Sydney, have a copy of the parts as originally issued, a set of bound volumes with plates in sequence as the original parts, and a set of volumes with the plates arranged in generic sequence. In the set of volumes in the Public Library, Adelaide, the plates are in the same sequence as in the original parts. The Public Library, Melbourne and Perth, have the plates rearranged into generic sequence.

BIRDS COLLECTED BY THE SIMPSON DESERT EXPEDITION (1939)

By H. T. CONDON, South Australian Museum.

Through the courtesy of Dr. C. T. Madigan, leader of the Simpson Desert Expedition (1939), a small collection of bird skins prepared by Mr. H. O. Fletcher, biological collector, have been deposited in the South Australian Museum.

The expedition travelled from Charlotte Waters to Andado Station, thence northward to the junction of the Hale and Todd Rivers. From the junction the party journeyed eastward across the Desert to the Queensland border, and thence south-east to the Mulligan River and Birdsville. From Birdsville they followed the Diamantina down to Lake Eyre, and thence round the east side of this lake to Marree. The trip commenced on May 28 and finished on August 8, 1939.

EPTHIANURA TRICOLOR GOULD 1841

Epthianura tricolor Gould, 1841, Proc. Zool. Soc. Lond. 1840, p. 159. South Australia.

A single specimen of the Crimson Chat, a male, was taken at Camp No. 8, 14 miles east of Camp 7.

S.A.M. No. B22319; Field No. 565; exposed culmen 11 mm.; wing 68; tarsus 16.

APHELOCEPHALA NIGRICINCTA NORTH 1895

Xerophila nigricincta North 1895, Ibis, p. 340. Missionary Plain, Central Australia.

The Banded Whiteface was one of the finds of the Horn Expedition, and has since been recorded from all parts of the inland from Landor Station on the Gascoyne River, Western Australia, to Tanami in the Northern Territory, Mt. Kintore and Moorilyanna in the far north-west of South Australia, and about Lake Eyre and Lake Frome. Details of specimens obtained by Mr. Fletcher:

S.A.M. No.	Field No.	Culmen	Wing	Tarsus
B22320	556	8 mm.	557	16
B22321	560	8	558	17
B22322	561	8	555	18
B22323	562	8	555	17
B22324	563	8	557	18
B22325	564	8	556	17
B22326	580	8	556	17

Locality of B22326: Camp 11, one mile east of Camp No. 10. The remainder were all taken at Camp No. 8.

MALURUS LEUCONOTUS GOULD 1865

Malurus leuconotus Gould, 1865, Proc. Zool. Soc. Lond. 1865, p. 198, interior of South Australia.

Malurus cyanotus Gould, 1865, Handb. Birds Austr., vol. i., p. 331. New South Wales.

The Blue and White Wren was seen each day throughout the trip by members of the expedition.

Details of specimen: S.A.M. No. B22331; Field No. 579; sex male; culmen 8 mm.; wing 49; tarsus 18. Locality: Camp No. 11, one mile east of Camp No. 10.

MALURUS LAMBERTI MASTERSI MATHEWS 1912

Nov. Zool., xviii, p. 360. Alexandra, Northern Territory.

Four specimens of the Purple-backed Wren were obtained. The tops of the heads of the two males have some grey feathers.

Details of specimens:

S.A.M. No.	Field No.	Sex	Culmen	Wing	Tarsus	Locality
B22327	557	male	7 mm.	48	20	Camp 8
B22328	558	female	8	46	20	Camp 8
B22329	559	male	8	46	20	Camp 15, Hay
B22330	600	female	9	46	20	River, flood plains

CERTHIONYX VARIEGATUS LESSON 1830

Certhionyx variegatus Lesson, 1830, Traite d'Orn. livr. 4, p. 306. Timor, error equals Western Australia.

One Pied Honeyeater, a female, was obtained towards the eastern border of the Desert. Plumage is fresh and unworn and of somewhat darker appearance than in worn specimens. S.A.M. No. B22332; Field No. 587: culmen 17 mm.; wing 81; tarsus 18; locality, Camp No. 13, thirteen miles east of Camp No. 12.

The following notes have been supplied by Mr. Fletcher:

"The bird life noted in the Simpson Desert during the months of June and July, 1939, exceeded in numbers what one would expect for this central desert region. The birds noted daily consisted of the following species:—Budgerygar (*Melopsittacus undulatus*), Crimson Chat (*Epthianura tricolor*), Banded Whiteface (*Aphelocephala nigricincta*), Wrens (*Malurus* spp.), Pied Honeyeater (*Certhionyx variegata*). These species favoured the sheltered spinifex and mulga growing in between sand ridges. The species collected are by no means the only birds found in the Simpson Desert. They are representatives of the more common forms, but from time to time other small drab coloured and very swift flying species were noted. Occasional crows and hawks were seen almost daily but not in great numbers as experienced in other parts of Central Australia.

"At the Hay River, on the eastern edge of the desert, the birds increased as we entered more or less timbered country."

RECENT ADVANCES IN THE STUDY OF THE SPECIES

By H. T. CONDON.

Zoologists working in museums are primarily concerned with the sorting of the unending diversity of animal forms received by them. This involves, firstly, separating certain forms considered to belong to different species, and secondly the comparison of these with all other known similar forms so that eventually the species may be determined. This law of order or classification. with the use of "scientific names" is known as *taxonomy* or *systematics*. In the past this "sorting" was often carried very little further—the worker was a "cataloguer" rather than a biologist. Even to-day in the lesser-known groups, it may not be possible to go beyond this cataloguing phase.

At this stage of unrefinement, taxonomy may be regarded merely as the servant of other branches of biology, without much general interest or application. However, as certain groups become better known it is apparent that the simple Linnaean concept of a static and morphological species is inadequate. The intensive pursuit of practical aims in some fields often reveals taxonomic facts unavailable to museum workers, and genetics, field natural history, ecology, biogeography, and medical biology all contribute to a broader concept of the subject.

Linnaeus regarded each species as the product of a separate act of creation and quite distinct. Groups of similar species he placed in genera, each species bearing two names, one to designate the species, the other the genus. This is known as binomial nomenclature, and is the basis of all present-day zoological nomenclature.

With the realisation that species everywhere are subject to variation, it has been found that there are many *kinds* of species, and it has been found necessary to introduce several new terms.

At this stage it may be advantageous to quote one of the most recent definitions of a species (Mayr, 1940).

"A species consists of a group of populations which replace each other geographically or ecologically and of which the neighboring ones intergrade or interbreed wherever they are in contact or which are potentially capable of doing so (with one or more populations) in those cases where contact is prevented by geographical barriers."

The question may be asked "Are species real?" It is now generally concluded that such a unit is real only if it is delimited against other units by fixed borders or definite gaps. *Sympatric species* are those which occur together. that is, their areas of distribution overlap or coincide. *Allopatric species* exclude each other geographically, and the gap between them is often gradual and relative. *Synchronic species* are contemporary species, while *allochronic species* do not belong to the same time level and would be indistinguishable if the fossil record were complete. *Sibling species* are sympatric species which are morphologically similar or indistinguishable, but do not inter-breed and possess other specific characters.

SUBSPECIES AND *CLINES*

The museum zoologist soon notes the amazing correlation between geographical distribution and "infra-specific categories," that is, local races, subspecies, and so on. Impatience with the specialists who often discriminate subspecies on almost imperceptible differences of size and color is sometimes expressed. Only from an examination of scores of museum specimens can one be convinced of these distinctions, which usually reflect precisely the degree to which the geographical range of a species is governed by topographical and climatic factors.

Thus, nowadays the importance of the *species* is lessened, since most work is done on its subdivisions, the subspecies and populations. Adequate samples of these subdivisions, known as "series" in museums, are the real taxonomic units. The *subspecies* has been defined as a "geographically localised subdivision of the species which differs genetically and taxonomically from other subdivisions of the species." They are usually indicated by adding a third name to the binomial nomenclature. "Subspecies are

of the utmost importance in studies of migration, distribution, the origin and development of faunas, etc.—problems entirely apart from the systematic listing and cataloguing of eggs or skins, or the study of life histories." (Witmer Stone 1927.)

Prof. Julian Huxley (1939) recently introduced the term *cline* or *character gradient* to indicate regional adaptation of a continuous population. In the Adelaide Rosella (*Platycercus*) a cline involving plumage colour may be recognised amongst even a small series of specimens which become progressively yellower from the dark red race *fleurieuensis* about Cape Jervis, the race of the Adelaide hills *adelaidae*, to the pale yellow form *subadelaidae* of the Flinders Ranges.

SUPERSPECIES AND *SEMISPECIES*

Many species which exclude each other geographically are strongly specialised and merely "glorified" geographical races. It is therefore possible to combine them into a single species and the term *Formenkreis* was introduced in 1900 by Kleinschmidt, a German. Another German, Rensch (1929), introduced the term *Artenkreis* as more specifically applying to these forms. An alternative English term *superspecies* was later introduced by Mayr (1931), who says "A superspecies consists of a monophyletic group of geographically representative (allopatric) species which are morphologically too distinct to be included in one species."

Semispecies are those which have attained species rank on the basis of morphological criterea, but which are merely geographical representatives of other species. Australian examples include the Southern, Northern and Western Yellow Robins (*Eopsaltria*).

POLYTYPIC AND *MONOTYPIC SPECIES*

The *polytypic species* is a group of geographically-intergrading populations, or subspecies. It has also been termed *Rassenkreis* (Rensch 1929). Over eighty subspecies are known at present of the Golden Whistler (*Pachycephala pectoralis*), which occurs in the East Indies, Papua and Australia. *Formenkreis* is a term which has also been applied to the polytypic species.

In contrast with polytypic species, those species which have such a small range that within it there is no opportunity for geographic variation or else are exceedingly stable (for some reason unknown) are termed *monotypic species*, i.e., those which do not break up into races (Huxley, 1940). The German term is *Art* (Rensch, 1929). The majority of species are polytypic, and it is significant that monotypic species are more numerous amongst groups which are not so well-known, and their numbers are constantly being reduced.

ECOTYPES OR *PHENOTYPICAL RACES*

In certain groups, such as the mollusca and insects, it has been found that wherever similar ecological conditions re-occur in widely separated places, similar modifications of the species (*ecotypes*) occur. These cannot be regarded as ecological races, but merely an expression of the same or a similar combination of environmental factors wherever they occur, and modifications of a practically identical genetic background. True subspecies differ genetically.

THE GENUS.

This is difficult to define. Different workers have different ideas, but it is now generally agreed that the genus (an artificial conception) to be convenient must in general be "neither too large nor too small." It includes one species or a group of species of presumably common phylogenetic origin, separated by a decided gap from other similar groups. The tendency nowadays is to recognise wide (and fewer) genera comprising many species.

Ornithology is in a peculiar position to render service to other branches of zoology because no group is better known taxonomically than the birds. Comparable results have been obtained in some groups of mammals, molluscs, butterflies and beetles, but in other fields our knowledge is very incomplete.

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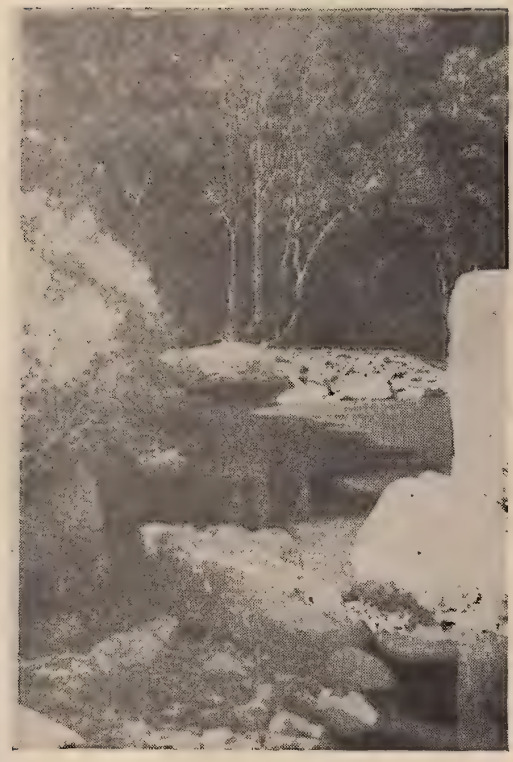

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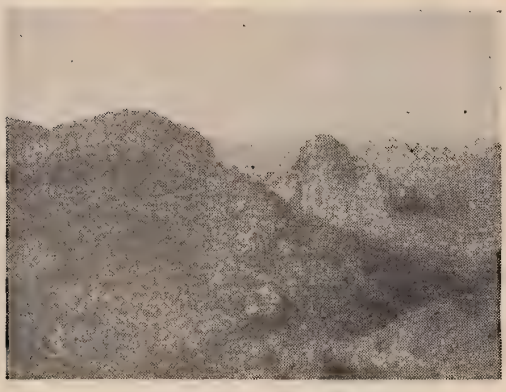

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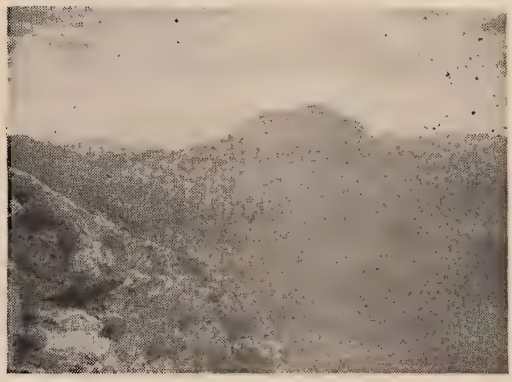

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CORDYCEPS GUNNII

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THE "VEGETABLE CATERPILLAR" CORDYCEPS GUNNII

By J. R. HARRIS

The frontispiece of this issue shows a reproduction of a specimen of the so-called Australian Vegetable Caterpillar found near Kingston in the South-East of this State, and sent in for identification by Mr. H. H. Pillar, of Kingston Public School.

Medieval naturalists were not altogether sure whether to regard these curios as animals, plants, or both; hence we have the Chinese rendering for one of them as "in spring grass, in winter worm." Others indulged in much ponderous and pointless philosophy (coloured, of course, by current beliefs in astrology, alchemy and spontaneous generation, and well steeped in traditions of theology and witchcraft) citing these strange, club-like or branching outgrowths from what appeared to be the mummified bodies of insects as evidence of a transmutation from animal to vegetable kingdom. We now know, however, that the relationship between the plant and the animal is a parasitic one, the susceptible insect host either consuming the fungus spores, which then germinate and invade the alimentary tract, spreading thence to all parts of the body, or else the insect comes into direct contact with mycelium of the fungus in the soil and so infection begins externally spreading throughout every organ until death results. Ultimately, such a dense mass of hyphae has been produced that the insect body remains mummified *in situ* and is actually a *sclerotium*, a resting or storage phase in the life-cycle of the fungus, dry, pithy and rather brittle, but still conforming to the general outline of the insect host which, although a little puffed out, is not unduly distorted and is still recognisable in good specimens. It is from this sclerotium that the fungus produces its above ground fruiting body, the *stroma*.

Fungi may propagate themselves in either or both of two ways. When food and environmental conditions are favourable to rapid growth, reproduction may occur by a simple process of constricting or budding off spores at the tips of upright hyphal filaments all over the mycelium, as, for example, the powdery green mould which grows on oranges and rotting fruit and vegetable matter. Such a stage is termed the asexual or conidial stage, and the spores, *conidia*. On the other hand, with sexual reproduction a compacted fruiting body may be formed which appears above ground, as, for example, with toadstools and mushrooms. Thus, under different environmental conditions, reproduction may occur in entirely different ways. The fungus parasitising the caterpillar may produce spores scattered over the weft of cottony mycelium covering the insect body, or it may produce a long, slender, club-shaped or branching mass of compacted hyphae rising from the buried sclerotium out above the ground. This stroma may be variously coloured, black, green, grey or red, delicate and slender from a few millimetres to stout and club-shaped or branching reaching up to twelve inches overall.

The mycologist may describe and name both these stages without realising that they may merely constitute different phases in the life-history of the same fungus, and so two names come into use for the one fungus. It has long been a recognised principle in botanical taxonomy that the best classification, the one approaching most nearly to a natural classification, is one based upon sexual reproduction characteristics and criteria. Thus, amongst the fungi, where the association of two stages is recognised, the name of the perfect stage prevails over the name of the imperfect or conidial stage. This leads us often, however, to the surprising state of affairs where fungi grouped into the same genus on the grounds of possessing very similar perfect stages may possess quite unrelated imperfect stages, providing an example of the artificiality of classification based on asexual characters. And so it is in the genus *Cordyceps* (Fries) Lk., the genus which includes the vegetable caterpillars, where conidial stages of *Isaria*, *Hirsutella*, *Hymenostilbe*, *Stilbella*, *Cephalosporium* and *Sporotrichum* are produced by different species. Although for the Australian species of *Cordyceps* so far described a true conidial stage has never been obtained for sure, it is believed that if existent it is most likely to be an *Isaria* stage

appearing as a mass of cottony hyphae externally enveloping the insect mummy, and would be underground in soil cavities.

Just as the toadstools and mushrooms of the Basidiomycetes produce a prominent perfect stage above ground level, the fruiting body of *Cordyceps* arises from the buried sclerotium as a club-shaped, slender to stout, branching or unbranched stroma consisting of a sterile stalk (stipe), fertile spore-bearing surface, and sometimes terminating in a short sterile tip. The spores are not borne naked on basidia over the surface of a gill (e.g., toadstools) or lining a pore (e.g., Polypores) or over a smooth or wrinkled hymenium as in other Basidiomycetes, but a careful examination of the fertile area of the stroma shows it to be covered with a mass of tiny raised papillae which are actually the protruding necks of tiny flask-shaped cavities embedded in the stroma, and it is lining the insides of these cavities that the spores are produced in packets of eight or multiples thereof enclosed in slender cylindrical envelopes, the *asci*. Thus these fungi belong to the Ascomycetes, and so are related to the cup-fungi, differing from them in that, instead of producing their asci lining a large saucer-shaped fruiting body, they are found lining the insides of flask-shaped *perithecia*. At maturity the apex of the ascus ruptures and the long, slender, filiform ascospores are disgorged into the body of the perithecium from which they exit through the mouth or *ostiole*. The shedding of these slender, hyaline spores frequently cloaks the dark coloured fertile portion of the stroma with snowy floccules.

The genus *Cordyceps*, which was established by Fries in 1849, but had its definition later emended by Link, belongs to the tribe Cordycipiteae of the family Hypocreaceae (perithecia immersed wholly or partly in a stroma), order Hypocreales (perithecia and stromata brightly coloured, soft and fleshy, not carbonaceous) of the Pyrenomycetes, the group of Ascomycetes in which the asci line perithecial cavities. According to Kobayasi (1941) the genus is a cosmopolitan one containing some 137 valid species, although there were previously some two hundred odd specific names in use, but even so, *Cordyceps* are for the most part rather rare and about half of the species are still only known from their type collections. Almost all of them are entomogenous. i.e., parasitising insect hosts either in adult, larval, nymph or pupal stages, but two are found on the sclerotia of *Claviceps* (ergot) and five on the fruiting bodies of the fungus *Elaphomyces* (i.e.. these seven species are mycogenous), while five others are known on spiders.

The only species so far recorded from this State is *C. Gunnii* Berk., which was first described by Berkeley (1848) from some material collected a few years previously in Tasmania by a Mr. Gunn, who in a letter states, "The caterpillar and stipes varied from five to eighteen inches in length, and were white, except about two or three inches which projected above the surface of the ground, and were shaded off from the white colour below ground to yellow at the surface, and thence to a deep olivaceous black at the extremity." As Cooke's (1892a) description of the fungus was considered to be rather inadequate, Tepper and McAlpine (1897) drafted a more complete description based on seven South Australian collections. Cooke (1892a and b) records *C. Gunnii* from Tasmania, Victoria (near Melbourne) and New South Wales (Hunter River), but states that the largest number of specimens were found near Launceston. Olliff (1895) mentions its occurrence in South Australia as well as the other three States, but he is not any further specific in his locality, and so this record is a doubtful one. The first authentic record comes from Tepper and McAlpine (1897), of whose material four specimens were collected at Sellick's Hill by Mr. Gratwick and three at Kingston by Dr. A. Engelhardt. Since then the only other collections known to have been made in this State have been found during June and July of 1942 and 1943 in the neighborhood of Kingston.

The fungus parasitises the larvae of Lepidoptera of the family Hepialidae. Olliff (1895) claims that *Pielus* is the genus involved with *Trictena* also a possibility. Tepper and McAlpine (1897) claim that their specimens do not appear to be on *Pielus*, but that the form of the larvae is suggestive of that of families Lasiocampidae or Agrotidae. In these latter two families the larvae are not underground root feeders as are the Hepialidae, the Ghost or Swift Moths, but feed above ground and descend into it only to pupate. The same suggestion has been made for certain Cossidae. The fact is that en-

tomologists do not agree on the hosts parasitised, and in any case, there is no suggestion that the fungus is extremely specific in its host range. The insects which only enter the ground to pupate are there for such a short period that it is questionable whether infection by the fungus and sufficient invasion of organs and tissues to cause death could occur in that time. Thus it is more likely that the usual host of *C. Gunnii* is a member of the Hepialidae, probably a member of *Pielus*, *Porina* or *Trictena*.

There is a good deal of variation amongst the stromata of *C. Gunnii*, but the size and form of the ascospores is reasonably regular as long, narrow, slender, filiform spores which after emergence from the ascus break up into a large number of small, truncated, rather quadrate spores. Occasionally two or more stromata may spring from the same sclerotium. Such stromata may arise from either the head or the anal segment of the insect, depending on which is uppermost, for the insect always assumes a more or less vertical position in the soil. In Mr. Gunn's original account of the Tasmanian specimens he mentions their appearance in sandy soil after a heavy rain, but Olliff's (1895) specimens were obtained in gullies with "rich black soil consisting largely of leaf-mould overlaying shale," and then always close to black wattles (*Acacia elata* Cunn.). The Tepper and McAlpine (1897) specimens were obtained in "very rich black soil during wet weather."

Probably one of the most interesting species of *Cordyceps*, interesting on account of the uses to which it is put rather than its morphology, is *C. sinensis* Berk., the celebrated "Chinese Plant Worm." It is highly esteemed by the Chinese and Tibetans as a valuable tonic, and many of the virtues attributed to it make the advertisements for our modern proprietary medicines seem amateurish. "It is sweet. It is good for protecting the lungs, enriching the kidneys, stopping the flowing or spitting of blood, decomposing the spittle and for curing consumption" is the translation from one Chinese work pertaining to its uses, while Stuart's Chinese Materia Medica claims, "It is considered to be restorative and tonic and is used in jaundice, phthisis, and in cases of injury of any serious nature."

Its antiquity in Chinese medicine is probably of the order of two thousand years. Western attention was first drawn to it when in Bretschneider's Early European Researches into the Flora of China mention is made of it being sent along with other drugs to the Paris Academy of Sciences by Father Parennin in 1723. In 1726 de Reaumur figured it in a French periodical, but was unable to explain the mystery of its production. Ten years later, Du Halde (1736) mentions it as being scarce, but found in small quantities in the province of Se-tchuen bordering on Tibet, and known as "Hia Tsao Tchong" (literally summer herb, winter worm). In 1841 Prof. Westwood exhibited specimens at a meeting in London of the Entomological Society, and claimed that its proper name was "Hea Tsaon Taong Chung." In 1842 Dr. Pereira sent an account of it to the Pharmaceutical Journal and later embodied this in his Materia Medica of 1855. Eventually (1843) it was examined by the prominent mycologist, Rev. M. J. Berkeley, who named and described it.

According to Gray (1858), who prepared the first monograph on the entomogenous fungi, the Lepidopterous caterpillar parasitised belongs to the family Noctuidae, probably being a *Gortyna* in the larval stage. The whole plant measures up to five inches long, generally about three, of which about half consists of the swollen, mummified caterpillar, generally a light yellowish-brown, with a slender, club-shaped stroma arising from either the head or the anal segment, swollen over the fertile portion and terminating in a tapering sterile tip.

The fungus is gathered with an elongate digging instrument which is thrust into the soil, twisted and withdrawn, bringing out the insect sclerotium. The superficial dirt is shaken free and the fungus tossed into a sack. The sacks are sent to coastal merchants who brush them free of dirt, grade them and tie them up in bundles of a dozen or so individuals for marketing in Chinese medicine shops where they are sold by weight. One authority states that the best variety is produced in Kiading Fu in Szechuen Province, while that of Yuanan and Kweichow is considered second class. By the time they are marketed the bundles have been so battered and damaged through handling that it is almost impossible to tell much from them at all.

The relative value placed upon these seems

to vary considerably from time to time depending upon how scarce or abundant the *Cordyceps* may be. Du Halde (1736) stated that the plant-worm was of such scarcity that it was used only by the physicians of the Emperor, while black, old and rotten specimens cost four times their weight in silver. Ramsbottom in an appendix to Chaudhuri's (1931) article indicates the great value placed upon it by a Chinese general. Stuart's Chinese Materia Medica states that it is not so rare as in the days of Du Halde, nor is it so highly esteemed. Gist Gee (1918) indicates that it was quite cheap in Soochow medicine shops. Chow (1936) states that *C. sinensis* occurs in profusion in Sikang Province from which some 10,000 kilos are exported valued at $7 Mexican per kilo (i.e. about ten tons of dried fungus of total value of over eight thousand pounds).

There is also some slight confusion in the literature as to the principal sources of the so-called 'Chinese Plant Worm.' Du Halde (1736) claimed it came from Se-tchuen (or Szechuen or Szechwan) Province (the province of which Chungking is the capital), and Ramsbottom's (1931) material is claimed also to be from this province, but Gist Gee (1919) claims that the source is not Szechuen but Chinese Tibet, from which Chaudhuri (1931) also obtained his specimens. The bulk of the available evidence suggests that *C. sinensis* is probably quite widespread in the western uplands, being noted especially in Szechuen, Sikang and Eastern Tibet.

As a tonic, the action of preparations of the Chinese Plant Worm are claimed to be comparable to that of ginseng. It is apparently of widespread use in Asia, being known as 'Yartsa Gungbu' (lit. in spring grass, in winter worm) in Tibet and as 'Totsu Kaso' in Japan. Medicinal preparations of it may be made in any of three ways, viz. (a) eaten dry, (b) incorporated as an ingredient with other compounds in certain tonic preparations, (c) stuffed in meats or poultry, and in this form, as well as being considered a great delicacy, special benefits are claimed. "Boiled with pork it is employed as an antidote for opium poisoning, and as a cure for opium eating. Also with pork and chicken it is taken as a tonic and a mild stimulant by convalescent persons, and rapidly restores them to health and strength." The virtues are said to be greatly increased by stuffing it before cooking into the head of a drake or body cavity of a duck and roasting slowly when the effects are supposed to spread to all parts of the body. In this form it is known as 'Tsong Tsao Yah Dz' and is eaten twice a day for eight or ten days.

The orientation of the worm to the stroma of the fungus is considered to be most important in its medicinal applications, since when the stroma springs from the head end of the worm it is especially potent for ailments of the upper part of the body, while when arising from the anal segment for ailments affecting the lower part of the body.

Early naturalists were not quite certain whether the caterpillar was attracted to the plant and attached itself to its roots (so-called), or whether the 'roots' of the plant reached out and captured the caterpillar. One ancient Chinese author gives his account as "In winter it lives in the soil and can move like a silkworm. Its body is partially covered with hair. When summer comes the hair grows up out of the surface of the soil, and the whole worm turns into grass. If it is not taken, the grass will again turn into a worm in the winter."

The mycophagy of *Cordyceps*, however, is not restricted to the Chinese. The Maoris of New Zealand gathered *C. Robertsii*, Hook. (syn. *C. lavarum* Westd.), a large slender species measuring up to twelve inches overall, for culinary purposes. This 'vegetable caterpillar' was gathered chiefly around the roots of the 'rata' tree (*Metrosideros robusta*) and known as 'Pepeaweto' or 'Hoteto,' but was also found in 'Kumara' (sweet potato, *Convulvulus batatas*) beds and known as 'Aweto.' It was also found in the open bush, where no rata grew, and the names 'Weri' and 'Anuhe' were also applied to it. Gray (1853), Cooke (1892b), and Lloyd (1915) state that this *Cordyceps* parasitises the larval stage of *Hepialus virescens* (syn. for *Charagia virescens* Walk.), but Hudson (1928) states that this is based upon a misunderstanding on the part of earlier investigators, who referred all large larvae to this species, when in reality the parasitised larvae belong to the genus *Porina* Walk., of which nineteen species are known from New Zealand, and quite a number of these, if not all, are susceptible to the fungus.

Although this New Zealand species is one

of the largest in the world, it is eclipsed only by an Australian one, *C. Taylori* Berk., which parasitises the larvae of large Ghost Moth caterpillars, probably a *Pielus* or a *Trictena,* and which was first discovered on the banks of the Murrumbidgee in 1837 and which, according to Willis (1941), is also occasionally found in the Otways in Victoria. The stout fruiting body divides into numerous stout, rough branches suggestive of the antlers of a stag, and the whole may attain an overall length of twelve inches. Also in Australia we have the scarlet to orange *C. militaris* L., which is also familiar to English naturalists, and several other species, but as yet so little work has been done upon the Australian representatives, coupled with the fact that *Cordyceps* is never a very common fungus, that our knowledge of the group is most imperfect. Therefore, should any naturalist happen to chance upon any specimen of *Cordyceps* or anything resembling a fungal outgrowth of an insect body, he or she is strongly urged to send in the specimen for further identification.

Appendix: Descriptions of South-East collections from notes made by Professor J. B. Cleland.

CORDYCEPS GUNNII, Berk.

Caterpillar shrivelled and mummified, 5.0–6.5 cms. long, 0.7–1.0 cm. diameter, earthy brown with white fungus mycelium growing out from between the integuments and enmeshing soil particles; context firm, fibrous, whitish, consisting of tightly packed fungal hyphae replacing the animal organs; usually found to be vertically placed in the soil, but occasionally horizontal from depths of a few inches to as much as two feet below the surface.

Stromata vertical, always arising from anal integument in these collections, 13.0–15.5 cm. overall length, almost cylindrical in sterile stipe, about 1.0 cm. diameter with the distal 7–8 cm. fertile portion broadening to as much as 1.4 cm., finally tapering somewhat at the tip. Fertile portion smooth, furrowed or granular to papillate at maturity due to protruding necks of perithecia. Stipe rugose to striate, pale yellow contrasting to dark olive green to black clubs beset with white floccular spores.

Mr. Edquist believes that *Cordyceps* is relatively common in the South-East of this State. He has received from time to time numerous specimens from schools e.g. Wangolina (July 1913), Frances, etc., and these are probably *C. Gunnii.*

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NATURAL HISTORY AND GREEK COIN DESIGNS

By J. HUNT DEACON, M.A.A.N.

Throughout the whole series of Greek coins, the greater part of their designs were drawn from Natural History. Of this subject those selected from the flora and fauna are indeed most interesting, being treated, of course, realistically. Preference is shown to full figures, but nevertheless a great number are made up of some portion of an animal, bird, or plant.

The reasons for the choice of such types are many and varied, as will be seen in the illustrations accompanying this short note. Nos. 1, 2, 5, 6, 10, 13, 15, 16, 19, 21, 24, 25, 26, 29 and 30 all have allusion to some god or goddess; 3, 22, 25 to animals peculiar to some area; 18, 19, and 23 to production within some State; 4 and 14 to the legend concerning the foundation of the State; 9 and 23 to the name of the town; 17 as a 'canting' type; 8 is a representation of the god Poseidon in human form; and 28 portraits a monarch. With Nos. 11 and 12 opinions differ widely as to the reasons for selection; and with 7, 20, 26 and 31 no satisfactory explanation has been proffered.

Artistically the coins are most interesting, as they belong to a period before the advent of Christianity, and show how superior in the technical work of die-cutting and striking the Greeks were to those artists and workers of more modern times. To them the coin was a work of art, a thing of beauty, and intended as a memorial, for all time, of the culture of the Greeks. Comparing the artistry displayed upon these coins and those of modern issues, one realises that even with the crude appliances at their disposal, the Greeks could and did produce coins more artistic and more pleasing to the eye than are being manufactured at the present time, despite the advantages of modern machinery.

Many forms of artistic expression were either of late invention (as painting), or, those whose history was broken during the Dark Ages—but, not so the coinage. This important economic factor in our lives prevailed despite any disturbing influences, domestic or foreign.

Not only do we learn of the knowledge of the ancients in Natural History, but in their economic, political, and religious history, their art, their knowledge of metals, standards and weights, but in many other such subjects. Truly Numismatology is a very wide and far-reaching science.

(It is hoped that at some future date Mr. J. Hunt Deacon will supply us with other illustrations jointly combining numismatics and natural history.—Ed.)

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2. Tortoise (Aegina) 404–348
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THE 'SPINIFEX' OF THE EXPLORERS

By J. B. CLELAND.

The 'Spinifex' of the explorers and of popular nomenclature is, of course, not a *Spinifex* at all, but embraces species of the genus *Triodia* of the Fescues. How came about the adoption of this quite descriptive name of 'spinifex' to designate the Triodias, better and quite as aptly also called Porcupine Grasses? Sturt (Narrative of an Expedition into Central Australia . . . during the Years 1844, 5, and 6, published in 1849) seems to have been the first to call *Triodia* 'Spinifex.' He uses the word on at least four occasions and in terms that leave little doubt as to what plant was meant. In Vol. I, p. 251, he writes:

> 'The (sand) ridges were covered with spinifex, through which we found it difficult to force a way, and the flats with salsolaceous productions alone.'

On p. 353:

> 'Spinifex generally covered the sand ridges, which looked like ocean swells rising before us, and many were of considerable height.'

On p. 354:

> 'We passed over high ridges of sand, thickly covered with spinifex, and a new polygonum.'

(This was four days after leaving the Depot for the North-West. Was the polygonum Mr. Black's *Muehlenbeckia coccoloboides?*). And on p. 407:

> 'They (the natives) had even been amongst the spinifex gathering the seed of the mesembryanthemum (probably one of the large flowered Calandrinias), of which they must obtain an abundant harvest.'

From these extracts there is no doubt that the 'spinifex' of Captain Sturt was a Porcupine Grass (*Triodia*). Strange to say, a grass, later known as *Spinifex paradoxus* and now as *Zygochloa paradoxa*, was collected by Sturt and described by Robt. Brown as *'Neurachne paradoxa,'* the male flowers, which grow on separate plants from the female, not having been available, says Bentham, so that the relationship with *Spinifex* was not recognised. This plant, of course, under the circumstances could not have been intended by the word 'Spinifex' used by Sturt.

A clue to Sturt's mistake is perhaps to be found in Peron's account of Baudin's Expedition (Voyage de Decouvertes Aux Terres Australis, Vol. I, p. 112, 1807). At the end of June, 1801, they were at Bernier Island, near Shark Bay, and found on it three remarkable plants.

> 'The first of these three plants is a kind of Spinifex, at least it was thought to be so by our botanists. It grows in the most barren places, and displays a sort of moss that sometimes spreads over the ground to a considerable extent, and which describes a thousand agreeable forms, here spreading into long regular walks; these again presenting a number of little waving paths, describing at the same time divers figures that are more or less whimsical, resembling, in a word, the most picturesque and diversified parterre. This extraordinary plant is composed of an innumerable quantity of leaves, capillary, radical, sessile, inflexible, and so thorny, that it is impossible to touch any of these thickets of verdure without being immediately pierced with a number of small darts, which remain in the flesh and cause a considerable degree of pain. The prodigious thinness of these leaves, or rather of these thorns, makes them liable to a decomposition as rapid as absolute; and this plant may be a principal cause of there being so small a quantity of vegetative earth in some parts of the island.' (The quotation is from an English translation of Peron's Voyage of Discovery published in London in 1809, p. 91.)

J. Lort Stokes ('Discoveries in Australia,' II, 1846, p. 209), in 1841, noted that on Barrow Island 'in the valleys was a little sandy soil, nourishing the spinifex.'

Now there is a *Spinifex longifolius* with prickly leaves growing along the N.W. Coast of Australia, and Bentham says extending to 'narrow, rigid, often 1 ft. long, but not so pungent as in the Asiatic *Spinifex squarrosus.*' Was this the plant referred to by Peron and by King, or was it really *Triodia?*

Bentham states that the Asiatic *Spinifex squarrosus* is a prickly plant, and probably

from this the name of spinifex was derived. If Sturt had read Peron's account—and it is very likely that he had done so—one can quite understand his inferring that the intensely prickly grass he met with was surely the same as Peron's.

Mr. C. A. Gardner, Government Botanist of Western Australia, in answer to a query of mine, has kindly replied as follows:—

'The name "Spinifex" was first given by Linnaeus to an Asiatic species (*C. squarrosus*) inhabiting the sandy coasts of India, Burma, Ceylon, Java and China—a tussocky plant with glaucous, rigidly pungent leaves, hence the name. *S. longifolius*, R. Br., is very closely related to the Asiatic species, and is common all along the coast from King George's Sound to the shores of Admiralty Gulf. It is certainly very common around Shark Bay. The genus *Triodia* was named in 1810, and early travellers encountered both *T. pungens* and *T. irritans* in quantities in the eastern interior of the continent. A similarity in the habit of both of these species to *Spinifex longifolius* (not *S. hirsutus*) might easily have resulted in the application of the name "Spinifex" in a popular sense, although the species of *Triodia* were early known as "Porcupine grasses." The vegetation of Bernier and Barrow Islands probably includes a fair proportion of *Triodia pungens* and *Plectrachne bynoei* is also probably present. When not in flower these might easily be mistaken for *Spinifex longifolius*, for even to-day pastoralists lump species of *Triodia*, *Plectrachne* and some species of *Eriachne* under the general term "Spinifex." Peron was accompanied by a botanist, and thus it is probable that his reference to "Spinifex" was in all probability to the true *Spinifex*. The reference to Spinifex on Barrow Island by Stokes, on the other hand, might apply to any of the above. I think it fairly safe to assume that *Triodia* occurs on both Barrow and Bernier Islands.'

Sturt's account of his explorations in Central Australia must have been read by most of his successors in exploration. His use of the word 'Spinifex' for *Triodia*, not as yet called 'porcupine grass,' would seem descriptive and appropriate, and so would be freely used in their journals and would be also accepted by the pastoralists as they advanced into the arid interior. It is still much more frequently used for the Triodias than the term porcupine grass, and probably has come to stay.

SOME ITEMS OF BOTANICAL INTEREST IN THE EARLY HISTORY OF SOUTH AUSTRALIA *

By J. B. CLELAND.

The first systematic botanist to gather plants in South Australia was the great Robert Brown, whom Humboldt described as *facile princeps botanicorum*, easily the first of botanists. His opportunities for collecting were few—at islands in the Bight, on Kangaroo Island, at Port Lincoln, and when he climbed the mount near Port Augusta which Flinders named after him. No plants had been collected before this visit of Flinders—and Robert Brown's collection cannot have comprised more than a few hundred. When Mr. Black completed the 4th Part of his Flora on June 30, 1929—127 years after Robert Brown's visit—2,064 native plants were known from this State. His Revision of Part I has added another 103 to the number, and some more will appear in Part II. At the time of Robert Brown's visit in 1802, none of course were known. With the completion of the Revision of Mr. Black's Flora, nearly all the native plants existing in South Australia will have been described. There will be no room then for any further systematic *magnum opus* dealing with our native flora and including any large number of plants new to science. This, of course, does not mean that all the work that can be done on the systematics of our plants has been done—there is much still to elaborate in the descriptions, some species are known imperfectly, distributions should be recorded—and there

* Part of an Address given in honor of Mr. J. M. Black, A.L.S., on the presentation to him of the Natural History Medallion by the Field Naturalists' Section on behalf of the Victorian Committee.

must be some hundreds of new species still to be added. Black's Flora marks the end of an epoch in South Australian botany—the solid work is mostly done—the foundations surely laid by Robert Brown, a massive superstructure erected thereon by the labors of Baron von Mueller and Tate and Rogers and J. M. Black.

It remains for their successors chiefly to elaborate and adorn and supplement here and there.

It is interesting now to look back botanically to those early days when as yet there was no South Australia. Even New South Wales extended in 1788 only to the 135th degree of east longitude running through Elliston and west of Oodnadatta.

In 1627, says a Dutch recital, 'the South Coast of the Great South Land was accidentally discovered by the ship the Gulde Zeepaard, outward-bound from Fatherland, for the space of a thousand miles.' This discovery, Flinders estimated, took these early voyagers, Peter Nuyts amongst them, as far as the Isles of St. Francis and St. Peter, near Fowler Bay, in the west of the waters of this State.

In 1792 the French Admiral Bruny D'Entrecasteanx reached South Australian waters from the west but not quite so far as the Dutch in 1627.

In 1800, Lieut. James Grant in the brig *Lady Nelson* ('His Majesty's Tinder Box,' as she was called, when in the Thames, from her size and appearance) on his way to Port Jackson discovered our South-East and named Mt. Gambier, Mt. Schank (after Admiral John Schank who had invented the sliding keels with which the *Lady Nelson* was fitted), Cape Banks and C. Northumberland.

None of these three nations, the Dutch, the French or the English, had as yet set foot on our shores, so botanical collecting was impossible.

Somewhere towards the end of January, 1802, Flinders entered what are now South Australian waters from the west, naming the Great Australian Bight when he was at its head on Wednesday, January 27. One can imagine Robert Brown looking over the ship's side at the cliffs of the Bight and then later at the sandy coast-line, and judging this to be a desert shore, interesting no doubt but poor in plant life. A point on the mainland was named Point Brown, 'in compliment to the naturalist.' A little further on 'the water was much discoloured in streaks, at less than a mile from the ship,' so Flinders called it Streaky Bay. Point Westall was named 'in compliment to the landscape painter.' On February 7, still in Nuyt's Archipelago, Flinders mentions the botanists going ashore—and here probably Brown collected his first South Australian plants. He himself on St. Peter's Isle found the soil on top little better than sand, but it was overspread with shrubs, mostly of one kind, 'a whitish velvety plant—(atriplex reniformis of Brown, nearly similiar to what is called at Port Jackson, Botany-Bay greens).' Now this reference to *Atriplex reniformis*, which is now considered to be merely a form of our common *A. paludosus*, is the first record in print of a plant with a South Australian locality. It is true that Flinders' account of his voyage was not published until 1814, and that Robert Brown's 'Prodromus Florae Novae-Hollandiae et Insula van Diemen' appeared in 1810. In the Prodromus are described a number of plants that Brown collected within the boundaries of this State, but definite localities for them are not given, merely a letter of reference showing whether the plants occurred on the west coast of Australia, the south coast, and so on, and the south coast included, of course, the southern end of Western Australia as well as our coast-line. This absence of specific localities was rectified by the publication of Bentham's Flora Australiensis, 1863-1878, as Bentham had access to Brown's specimens and records the actual localities.

In the Investigator Group Flinders noted on Flinders Island that there was little Atriplex or of the tufted wiry grass and that the only trees were a few small Casuarinas. This reference to Casuarinas, the second plant recorded with certainty for South Australia, is also of unusual interest. This sheoak was named *Casuarina bicuspidata* by Bentham, who records that it was collected by R. Brown on Flinders Island. The plant is still only known by the type specimen that Brown collected and by a specimen found by Helms in the Victoria Desert of Western Australia in 1891. I presume the tree or shrub has long disappeared from the type locality, as otherwise more specimens of it would surely be available.

The only other references in Flinders' Voyage to plants are Eucalypts and *Casuarina* (*stricta*) on Thistle Island and at Port Lin-

coln, and mangroves at the head of Spencer Gulf.

James Backhouse, the Quaker, visited South Australia in November and December, 1837, and in 'A Narrative of a Visit to the Australian Colonies,' 1843, pp. 508—521, has given us some short accounts of the indigenous flora.

Mr. Black in his chapter on the 'History of Botany in South Australia' in the First Part of his Flora has given an account of the visits and the work of succeeding botanists and collectors, so that there is no need for me to deal with them in detail. There are, however, some items of botanical interest in Captain Charles Sturt's 'Narrative of an Expedition into Central Australia . . . . during the years 1844, 5 and 6' that are quite naturally not referred to by Mr. Black. This work was published in 1849, and Robert Brown, now 'F.R.S., F.L.S., D.C.L., etc.,' contributed a Botanical Appendix some 47 years after his visit to South Australian shores.

Of particular interest to the Field Naturalists' Section, whose badge is Sturt's Desert Pea, is that this handsome plant was amongst those collected by Sturt and one of the twenty-six described by Robert Brown in the Appendix to the Second Volume. With justice, Brown refers to it as 'one of the greatest ornaments of the desert regions of the interior of Australia, as well as of the sterile islands of the North-West Coast.' This reference to the North-West Coast is of special interest, as *Clianthus speciosus*, the oldest valid name for the species, was seen by Dampier in 1699 and specimens were saved and described by Woodward and figured in the account of the voyage in Tab. 4 Fig. 2. The description in the Appendix to the Voyage is:—'*Colutea Novae Hollandiae floribus amplis coccineis, umbellatim dispositis macula purpurea notatis.* There being no leaves to this plant, 'tis hard to say what *Genus* it properly belongs to. The flowers are very like to the Colutea Barbae Jovis folio flore coccineo Breynii; of the same scarlet colour, with a large deep Purple Spot in the *Vexillum*, but much bigger, coming all from the same Point after the Manner of an Umbel. The Rudiment of the Pod is very woolly, and terminates in a Filament near 2 inches long.'

The Desert Pea had next been found in 1817 in Western New South Wales by Allan Cunningham who in 1834 called it *Clianthus Dampieri*, but Don had already called it *Donia speciosa* from specimens collected by Captain King from the North-West Coast during his survey between the years 1818 and 1822. Eyre had seen it in the Gawler Ranges in 1839, and now Sturt had collected it in the Barrier Range in his Expedition of 1844-6.

ONE HUNDRED POUNDS
(£100)
REWARD

I HEREBY APPOINT SIR DOUGLAS MAWSON and PROFESSOR J. B. CLELAND as Trustees to hold in trust a fund of One Hundred Pounds (£100) from which the aforesaid Trustees may pay all or part to any person or persons who discover in South Australia fossil remains of rare or unknown marsupials, reptiles, or birds in Pleistocene, Pliocene, Miocene, or earlier geological deposits ON CONDITION that the specimen or specimens are presented to the South Australian Museum. The amount of the reward if any to be paid to the discoverer shall be left to the discretion of the aforesaid Trustees PROVIDED THAT the amount of the sum paid be approved by the Director of the South Australian Museum.

If one of the aforesaid Trustees shall decline to act or shall die the remaining Trustee shall have power to nominate a Trustee to fill the vacancy PROVIDED such nomination is approved by the Director of the South Australian Museum.

(Sgd.) W. Burdett.
26/1/39.

Witness:
(Sgd.) Herbert M. Hale.
26/1/39.

————:o:————

CLARKE MEMORIAL MEDAL

South Australian naturalists will be pleased to learn that Mr. John McConnell Black, of North Adelaide, South Aus'ralia, an honorary member of the Section, has been awarded the Clarke Memorial Medal by the Council of the Royal Society of New South Wales. Members of the Section are delighted to know that this distinguished botanist has received yet another honour.—B.C.C.

ARE THE SOW-THISTLES (Sonchus oleraceus and asper) INDIGENOUS TO AUSTRALIA?

By J. B. CLELAND.

J. M. Black in his 'Flora of South Australia' considers both *Sonchus oleraceus* and *S. asper* as introduced species but the maritime species, *S. megalocarpus*, as indigenous.

G. Bentham in 'Flora Australiensis' under *Sonchus oleraceus* says that this 'weed of cultivation . . . now distributed over the greater part of the globe . . . (is) perhaps truly indigenous in Australia.' He considered *S. asper* as a variety and stated that both occurred in Australia.

Is there any evidence to show or suggest that either or both species occurred in Australia before British colonisation in 1788? The evidence available may be considered under three headings:—

(1) Native names for the sow-thistle.
(2) Use of the sow-thistle as food by the natives.
(3) The record of sow-thistles by exploring parties in country far away from civilisation.

(1) Native names for the sow-thistle, if these were real names and not merely descriptive terms, would strongly support the view that they were indigenous. It must be remembered, of course, that a native when asked what the name was might be merely giving a description of the plant, just as we might say a 'green weed' or a 'milk thistle.'

R. Brough Smyth in 'The Aborigines of Victoria' gives two references to sow thistles. In a list of plants received from Coranderrk he mentions 'dalurp,' identified by Baron von Mueller as *Sonchus oleraceus* (II, p. 171).

(2) R. Brough Smyth quotes Dr. Gummow (I., p. 214) as mentioning that the sow-thistle was used as a kind of salad by the people of the Lower Murray in Victoria.

I remember, as a boy, about 1895, being very much surprised at seeing an insane aboriginal in the Parkside Asylum eat a sow-thistle. As I have never seen white people eat these, he could hardly have learnt to eat this plant from whites, and his doing so may have been a relic of his earlier days.

(3) On May 2, 1844, within sight of Rivoli Bay, G. French Angas ('Savage Life and Scenes in Australia and New Zealand, London, 1847, I, p. 155) says that 'some of the swamps were covered by an exceedingly rich black soil, and produced luxuriant sow-thistles and other rank vegetation.' Sir George Grey's party, of which Angas was a member, was one of the first to explore this country, though they met near here a Mr. Arthur and his men with sheep and dogs who had arrived some months before. In March, 1944, nearly a hundred years later and near the same spot, I saw some luxuriant examples of *Sonchus asper*, and it was probably this species, rather delighting in swampy ground, that Angas saw.

John McDouall Stuart, in his 'Journals' (p. 40), near Smoky Bay in the Great Australian Bight in August, 1858, wrote:—'Yesterday we obtained a few sow-thistles, which we boiled, and found to be very good.'

Ernest Giles ('Geographic Travels in Central Australia from 1872 to 1874,' Melb., 1875, p. 18) noted on September 7, 1872, that his horses had 'generally had green sow-thistles all along the river, where they grow in the lateral channels' on his way up the Finke when he found the Glen of Palms. On September 27, 1873, near the Mann Range in the N.E. corner of South Australia at a spot which Giles called Stevenson's Creek, the party came upon 'water bubbling up from the ground below, and running down the channel which was set with reeds and great quantities of enormous thistles.' In my copy of Giles' 'Geographic Travels,' which belonged to Thomas Gill, is a note on the fly-leaf by the author stating that 'many errors in type and grammar exist in this book . . . I had no opportunity of revising the proof-sheets.' Ernest Giles made many corrections and additions in this copy, some in ink, some in pencil. He inserted before the word 'thistles' in the above quotation, the word 'sow' in pencil. These two records of Giles of finding sow-thistles in abundance in newly discovered country far removed from civilisation suggest that this plant is either indigenous there, or else that it has outstripped all other species of introduced plants in their spread in Australia—a thing it might easily do.

In South Australia, *Sonchus asper* is found in two forms. One is in habit very like *S. oleraceus*, only the leaves are more rigid and rather prickly. The other is a tall, robust plant with very long narrow leaves and is usually found on low-lying ground swampy in wet weather or in rather shaded situations. It was this form that I found recently near Rivoli Bay and these plants were probably the descendants of the 'luxuriant sow-thistles' that Angas saw. Thinking that this might be a variety peculiar to Australia, I submitted specimens to Miss C. Eardley for examination. In a note to me she told me she consulted the European Floras on the subject, viz., Hegi, 'Flora von Mitteleuropa'; Coste, 'Flore de France'; Fiori, 'Flora Analitica d'Italia'; Bonnier 'Flore complete de France, Suisse et Belgique'; besides Engler and Prantl which is not detailed enough. The various authors give 45-70 as the number of species in the genus and these are distributed in Europe, Africa and Asia, and naturalised elsewhere. I have only examined European literature, and think this is definitely some form of *S. asper*. Each of the authors above mentioned has a different group of varieties and forms described under *S. asper* (Linnaeus himself included *S. asper* under *S. oleraceus*).

Bonnier describes *S. asper* Vill. *v. gracilis* Albert as having leaves quite entire, but finely denticulate—spiny on the edge; he does not state the size. I suppose one might label this *S. asper* v. *gracilis* for the little that may be worth."

The evidence available suggests therefore that this form of *S. asper* is indigenous to Australia.

BOOKS FOR COUNTRY READERS

By W. G. BUICK

Have you ever stopped to think how much a modern community relies on the printed word for its well-being? Indeed, it is not easy to find many activities which do not depend directly or indirectly on information obtained from books. Of the things men do, sleeping and eating do not require books, but, in these days of calorie-consciousness, even eating is often determined by recipe books and "diet-charts."

The naturalist and the scientist know well the value of accessible books which soon become their pleasures and indispensable tools. But do you know that South Australians are able to borrow books on every subject, except fiction, quite free of charge?

The Country Lending Service of the Public Library of S.A. lends books to people outside the metropolitan area. Books go as far as the Northern Territory, remote islands off our coasts, to the South-East, the West Coast, as well as nearer places such as the Adelaide Hills. From all directions come requests for books about every conceivable subject. A list of the various ways in which these books are dispatched shows vividly the transport systems of South Australia. Some borrowers return their books personally, others by service car and carrier, some by post, and some of the books travel part of their way even by camel. Ships and planes are also used, while the greatest number of books travel by train, as a special concession rate is operating for Public Library books. An average rail parcel costs threepence or fourpence. Incidentally, the reader pays only the return freight—the library pays the outward. Three books are allowed at a time. The normal reading time allowed is one month, but, if necessary, this can often be extended.

At present the Country Lending Service has 25,000 books, but purchases in England, America, as well as in Australia, continually increase the stock. Special attention is paid to books presenting an Australian aspect, so that students can keep up with local affairs. Anyone interested in natural history will appreciate this.

The books of most interest to field naturalists are those which belong to Class 500 (Natural History) of the Dewey Decimal Classification, which is used throughout the Public Library to arrange its quarter million books. This class includes astronomy, physics, chemistry, geology, palaeontology, biology, botany and zoology. The agriculture, gardening and travel sections will also be of interest.

The officers of the service believe that good

reading habits should be started in childhood. The children's section is therefore considered at least as important as the adult. Many books are sent two at a time to children living in the country. The same conditions apply as for adult books. Quite often whole families are members—large parcels with books on farm buildings and travel for father, books on weaving, cooking and biography for mother, horsebreaking and drawing for big brother, and, say, "The Golden Book of Animal Stories" and a school story for the little girl, are typical dispatches.

Schools, too, receive attention. They are sent in boxes of ten or twenty books each term, according to the size of the school, on the same general principles as the individual borrowings.

Since 1938, when the service commenced, over 246,000 books have been lent. If you or your friends in the country are interested in this free service, write to the Principal Librarian, Country Lending Service, Public Library of S.A., Box 386A, G.P.O., Adelaide; or call at the library on North Terrace.

SIZE OF RED GUMS AT STONYFELL

Seedling Red Gums (*Eucalyptus camuldenensis-rostrata*) were planted at Stonyfell from the stable east along the vineyard fence in the season 1862-3. The circumferences of the six trees at about 4 feet 6 inches from the ground on January 27, 1945, were—(1) 11 ft.; (2) 8 ft. 4½ ins.; (3) 10 ft. 3 ins.; (4) 9 ft. 11 ins.; (5) 12 ft. 7 ins.; (6) 15 ft. This last tree had its roots apparently in the silt of an old dam.—A. Crompton.

AUSTRALIAN LIMPETS OF THE FAMILY LOTTIIDAE

By BERNARD C. COTTON.

The limpets of this family are distinguished from the typical limpets of the Patellidae by the non-iridescent interior of the shell and the defined internal border of the aperture. In Patellidae the gills form an almost complete cordon surrounding the foot. In the Lottiidae there is a simple, plume-like gill. The shell may be large and limpet-like or range to minute, thin and hyaline shells. A key to the genera and species of Southern Australian representatives is given here, and the whole of the Australasian species are listed with genotypes, type localities and distribution. The distribution for Australian localities is abbreviated in the obvious manner, N.N.S.W. = Northern New South Wales, W. Vict. = Western Victoria, etc. All South Australian species are figured, the external and internal view, showing the spatula, is given, or the ventral and lateral view. Figure numbers and comparative sizes are given in the explanation of the plate.

FAMILY LOTTIIDAE.

Limpets. Shell patelliform, conical, apex a little anterior; protoconch conical, not spiral. Animal usually having eyes; a plumose, cervical, external gill with or without a marginal cordon. Radula with median tooth rarely present, lateral teeth three on either side.

PATELLOIDA Quoy and Gaimard 1834. (*Patelloida rugosa* Quoy and Gaimard 1834) —*rugosa* Quoy and Gaimard 1834. Amboina. (type) . —*nigrosulcata* Reeve 1855. W.A. (type). —*alticostata* Angas 1865. S.A. (type), Vict. —*alticostata complanata* Iredale 1924. N.S.W. (type), S.Q. (smooth). —*alticostata antelia* Iredale 1924. N.S.W. (type), S.Q. —*corticata* Hutton 1880. Dunedin, N.Z. (type). —*corticata corallina* Oliver 1926. Wellington, N.Z. (type). —*corticata pseudocorticata* Iredale 1908. Lyttelton, N.Z. (type). —*hamiltonensis* Chapman and Gabriel 1923. Vict., Muddy Creek (type), fossil Lower Pliocene.

COLLISELLINA Dall 1871. (*Patella saccharina* Linne 1758).—*saccharina* Linne 1758. Philippines (type). Andamans, Japan, Funafuti = *stellaris* Bolten 1798. —*lanx* Reeve. Japan (type). —*stella* Lesson 1830. N.A., N.W.A., New Ireland (type), Fiji. = *stellaris* Quoy and Gaimard 1835. New Ireland (type). —*latistrigata* Angas 1865. S.A. (type), Tas., Vict. —*submarmorata* Pilsbry 1891. N.S.W. (type), Vict., Tas., S.Q.

CHIAZACMEA Oliver 1926. (*Patelloida*

flammea Quoy and Gaimard 1834)—*flammea* Quoy and Gaimard 1834. Tas (type), S.A., Vict. —*conoidea* Quoy and Gaimard 1834. W.A. (type), S.A. —*mixta* Reeve 1855. Tas., S.A., Vict. *cavilla* Iredale 1924. N.S.W. (type). —*minula* Iredale 1924. N.S.W. (type), Tas. —*queenslandiae* Oliver 1926. Q. (type). —*mufria* Hedley 1915. N.S.W. (type). —*heteromorpha* Oliver 1926 Q. (type).

ASTERACMEA Oliver 1926. (*Helicioniscus illibrata* Verco 1906).—*illibrata* Verco 1906, W.A., S.A. (type). —*mellila* Iredale, 1924. Tas. (type), N.S.W. —*suteri* Iredale 1907. N.Z. (type). —*axiaerata* Verco 1912. W.A. (type). —*stowae* Verco 1906. W.A., S.A. (type). —*crebristriata* Verco 1904. W.A. S.A. (type). —*roseoradiata* Verco 1912. S.A. (type).

RADIACMEA Iredale 1915. (*Acmaea cingulata* Hutton 1883).—*inconspicua* Gray 1843. N.Z. (type). = *cingulata* Hutton 1883. —*rubiginosa* Hutton 1873. Chatham Island, N.Z. (type). —*intermedia* Suter 1907. Bounty Islands, N.Z. (type). —*macquariensis* Hedley 1916. Macquarie Island, N.Z. (type).

NACCULA Iredale 1924. (*Patelloida punctata* Quoy and Gaimard 1834).—*punctata* Quoy and Gaimard 1835. W.A. (type), S.A. —*compressa* Verco 1906. S.A. (type), W.A.

ACTINOLEUCA Oliver 1926. *Patella campbelli* Filhol 1880).—*campbelli* Filhol 1880, Campbell Island (type), Auckland Islands, N.Z. —*calamus* Crosse and Fischer 1864. S.A. (type), Vict., Tas., N.S.W., W.A. —*polyactina* Verco 1912. S.A. (type), W.A. —*multiradialis* Chapman and Gabriel 1923. Vict. (type), fossil Balcombian.

NOTOACMEA Iredale 1915 (*Patelloida pileopsis* Quoy and Gaimard 1834)—*pileopsis* Quoy and Gaimard 1835. N.Z. (type). —*sturnus* Hombron and Jacquinet 1841. N.Z. (type). —*cellanoides* Oliver 1926. N.Z. (type). —*subantarctica* Oliver 1926. Campbell Island, Auckland Island, N.Z. (type). —*mayi* May 1923. Tas. (type), Vict. —*septiformis* Quoy and Gaimard 1834. W.A. (type), S.A. = *elongata* Quoy and Gaimard 1834 (=*septiformis* juvenile), W.A. (type). —*scabrilirata* Angas 1865. S.A. (type), Vict., Tas., N.S.W. —*petterdi* Tenison Woods 1877. N.Tas. (type), Vict., N.S.W., S.Q.

PARVACMEA Iredale 1915. (*Acmaea daedala* Suter 1907).—*daedala* Suter 1907. N.Z. (type). —*subtilis* Suter 1907. N.Z. (type). —*nukumaruensis* 1926. N.Z. fossil Pliocene (type). —*helmsi* Smith 1894. N.Z. (type). —*virescens* Oliver 1926. N.Z. (type).

CONACMEA Oliver 1926. (*Acmaea parviconoidea* Suter 1907).—*parviconoidea* Suter 1907, genotype. N.Z. (type). —*corosa* Oliver 1926. Tas. (type). —*subundulata* Angas 1865. S.A. (type). =*alta* Oliver 1926. S.A. (type).

THALASSACMEA Oliver 1926. (*Notoacmea badia* Oliver 1926).—*badia* Oliver 1926. Dunedin, N.Z. (type).

SUBACMEA Oliver 1926. (*Notoacmea scopulina* Oliver 1926).—*scopulina* Oliver 1926. N.Z. (type). —*corrodenda* May 1919. Tas. (type).

ATALACMEA Iredale 1915. (*Patella fragilis* Sowerby 1823).—*fragilis* Sowerby 1823. N.Z. (type).

KEY TO THE SOUTH AUSTRALIAN GENERA OF THE LOTTIIDAE.

a Radula with two marginal teeth on each side
  b Shell radiately ribbed
    c Strong radiate ribs
      d Regular prominent ribs .. .. *Patelloida*
      dd Seven ribs more prominent than the other two .. .. *Collisellina*
    cc Weak and low radiate ribs .. .. *Chiazacmea*
  bb Shell smooth .. .. *Asteracmea*
aa Radula with no marginal teeth
    e Central and lateral teeth diverging in two rows from the median line .. .. *Naccula*
    ee Central teeth in advance of lateral, which are in a transverse row
      f Shell porcellanous throughout .. .. *Actinoleuca*
      ff Shell with internal thin hyaline layer
        g Shell medium, moderate in height .. .. *Notoacmea*
        gg Shell small, highly conical .. .. *Conacmea*

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